MAY 24 1960

AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

Preview INDIANAPOLIS RACE CARS—1960

Front view of an A. J. Watson 1960 race car which is being readied for the Indianapolis "500". Note the high roll bar now required by the USAC.

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SERIAL RECORD
MAY 26 1960
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MAY 15, 1960

ALSO IN THIS ISSUE

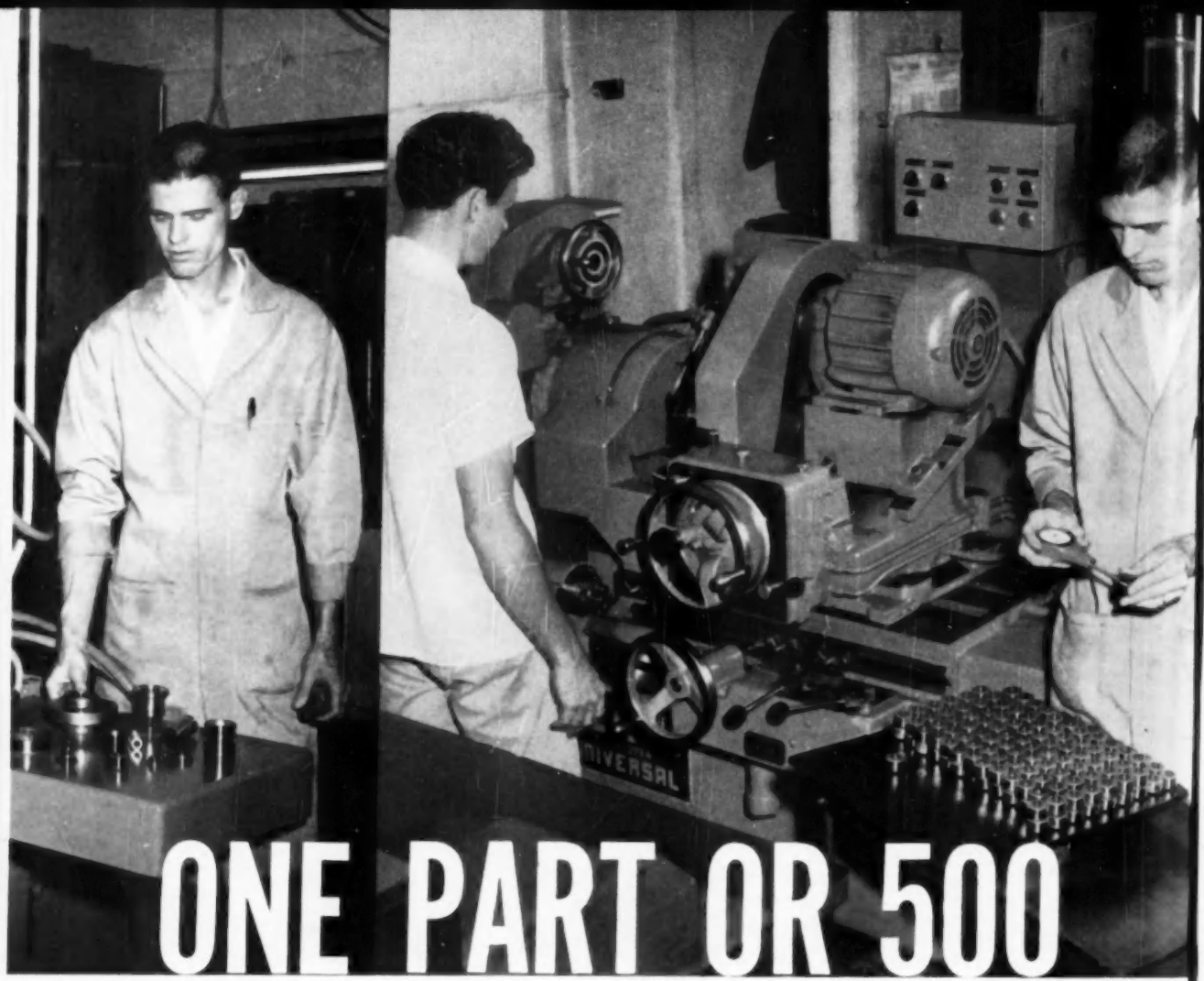
DETAILS OF THE MASERATI CAR

DESIGN ENGINEERING SHOW PREVIEW

EFFICIENT SETUP FOR VALIANT PRODUCTION

MAKING V-6 AND V-12 GMC TRUCK ENGINES

MANAGEMENT
ENGINEERING
DESIGN
PRODUCTION



ONE PART OR 500

Selco gets top grinding performance at rock-bottom cost with the

NEW HEALD MODEL 273A UNIVERSAL

The Heald Model 273A Universal Internal Grinder shown above is installed at the Selco Grinding Company — a small but busy job shop in southern California. Here it is used to grind straight or tapered I.D.s and O.D.s, and for rotary surface grinding of flat, convex or concave surfaces of a wide range of work — from individual parts to production runs. And it easily handles every job with far greater speed, accuracy, precision and finer finish than could be obtained on any of their previous equipment.

Until the advent of this Universal Grinder, most small job shops (and many larger ones, too) couldn't afford a machine of this type. But the Heald 273A costs about *half* as much as comparable machines today, and less than similar machines (with fewer features) cost in 1947!

Incorporating the latest advances in the grinding art, it holds tolerances to within .0001" in routine production, and within .000050" in special cases. Features include hydrostatic antifriction ways, full 20" table travel, several wheelhead positions, infinitely variable workhead speed from 150 to 450 rpm and 90 degree workhead swivel for rotary surface grinding.

Ask your Heald engineer for information on the New 273A — the only completely new machine with 1960 performance and a 1947 price tag.

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

Worcester 6, Massachusetts

Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York • Philadelphia • Syracuse

HEALD

It PAYS To Come To Heald

MAY 24 1960

KNOW YOUR ALLOY STEELS . . .

This is one of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Normalizing Alloy Steels

There are several forms of heat-treatment commonly employed in the processing of alloy steels. Each in its own way modifies the mechanical properties and structures of steel, and each is chosen with a definite objective in mind. The five usual forms of treatment are normalizing, annealing, spheroidize-annealing, quenching and tempering, and stress-relieving.

In this particular discussion, let us consider briefly the purposes and effects of normalizing.

Normalizing is an operation in which the steel is heated to approximately 100 deg F above the upper transformation range, then cooled in still or agitated air. The basic purpose is to refine the prior structure produced by variations in finishing temperatures encountered in rolling or forging. The structure resulting from normalizing, being more uniform, will help create improved mechanical properties when the steel is subsequently reheated, liquid-quenched, and tempered.

There are times when large steel parts (heavy forgings, for example) cannot be liquid-quenched because of their size. In cases of this nature, the heat-treatment must consist of single or multiple normalizing followed by tempering.

High-temperature normalizing is sometimes used for grain-coarsening low-carbon alloy steels to promote machinability. (In high-temperature normalizing, steel is heated to more than 100 deg F above the upper transformation range.) At times it is possible to machine a steel in the air-cooled condition, the governing factor being the alloy content. However, the highly alloyed analyses may require annealing or tempering after normalizing, to decrease the hardness.

It is essential, when normalizing is employed, that free circulation of still or agitated air be provided. When air-cooling of individual bars or forgings is not practicable, the furnace charge should provide for some means of separation, such as racks or spacers.

If you would care to know more about normalizing, or any other phase of heat-treating, you are invited to consult with Bethlehem metallurgists. They are always glad to give you any help you need.

And remember that Bethlehem makes the full range of AISI standard alloy steels, as well as special-analysis steels and all carbon grades.

This series of alloy steel advertisements is now available as a compact booklet, "Quick Facts about Alloy Steels." If you would like a free copy, please address your request to Publications Department, Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Circle 101 on Inquiry Card for more data

Circle 104 on Inquiry Card for more data

FOR EASE OF FINISHING HYDRAULIC CYLINDERS SPECIFY

B&W *Job-Matched seamless mechanical tubing*

B&W's comprehensive quality control procedure provides . . .

• good surface finish • dimensional accuracy
• controlled uniform mechanical properties

Quality is only one of the many reasons why it pays to specify B&W Seamless Mechanical Tubing. And remember, matching tubes to jobs assures low optimum cost as well as ease of finishing. For more information call your local B&W District Sales Office or write for Bulletin TB-418. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.

B&W

THE BABCOCK & WILCOX COMPANY

TUBULAR PRODUCTS DIVISION

TA-9049-SM3

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE • PUBLISHED SEMI-MONTHLY

MAY 15, 1960

Passenger Cars • Trucks • Buses • Aircraft • Tractors • Engines • Bodies • Trailers • Road Machinery • Farm Machinery • Parts and Components • Accessories • Production and Processing Equipment • Design • Production • Engineering • Management

VOL. 122 No. 10

Features • • •

▼ **Race Cars at Indianapolis "500"**

Most of the cars entered at Indianapolis this year have the time-tested 4-cyl Meyer & Drake engine. However, excellent performance is expected from the cars because of their many minor improvements. Page 57

▼ **Reliability Program at Buick**

A newly-introduced reliability program is in its beginning stages at Buick. It will come into full action just before the 1961 cars are produced. Page 61

▼ **Making GMC V-6 and V-12 Engines**

Production of GMC V-6 and V-12 gasoline engines is facilitated by the unusual number of interchangeable parts throughout the line. Page 62

▼ **Machine Tool Conference**

Advances in automatic controls were among the subjects at the 24th Machine Tool Forum Sponsored by Westinghouse Electric Corp. Page 65

▼ **New Maserati Four-Cylinder Sports Car**

The tube-frame construction of the Maserati four-cylinder sports car has prompted the popular name of this vehicle design "birdcage." Car is described in a four-page article. Page 66

▼ **Valiant Production at Hamtramck Plant**

Chrysler's Hamtramck Assembly Plant is turning out unitized bodies for Valiant cars at a high rate. Details of the setup are presented here. Page 70

▼ **Sales of Automotive Air Conditioners May Double this Year**

Climates to order in cars and trucks will be big business this year. An illustrated article tells why sales have climbed so fast. Page 80

▼ **Advanced Machining Lines at Simca Plant**

Simca is the fastest-growing manufacturer in the French automobile industry. Some of the plant equipment is described in Part I of a two-part article. Page 82

▼ **Design Engineering Show Preview**

Over 15,000 products will be displayed by 567 companies at the show in New York. Many of the products of tomorrow will come from this meeting of over 20,000 design engineers and executives. Page 87

▼ **43 New Product Items and Other Features Such as:**

Machinery News, Government Contracts, Observations, and Manufacturers' News.

. . . continued on next page

MEMBER SBME Society of Business Magazine Editors

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NBP National Business Publications, Inc.

BPA Business Publications Audit of Circulation

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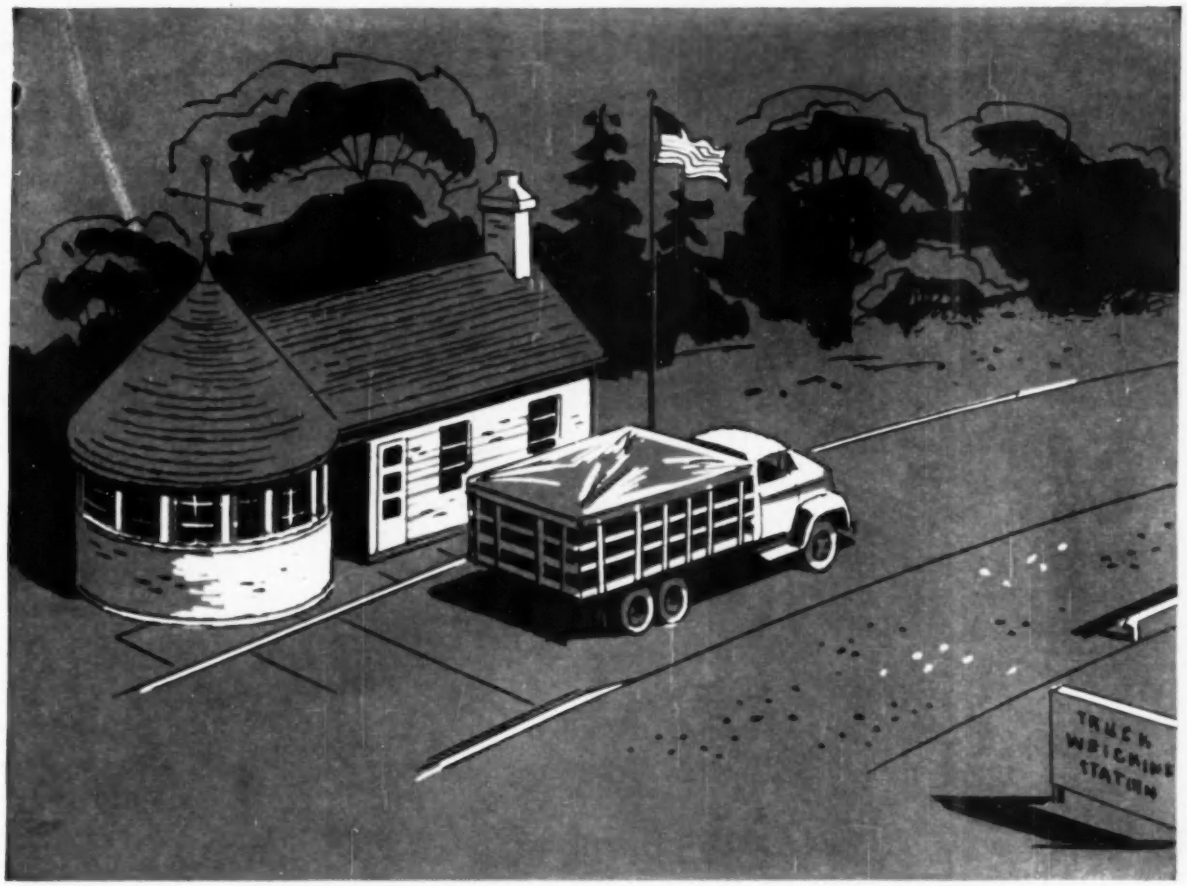
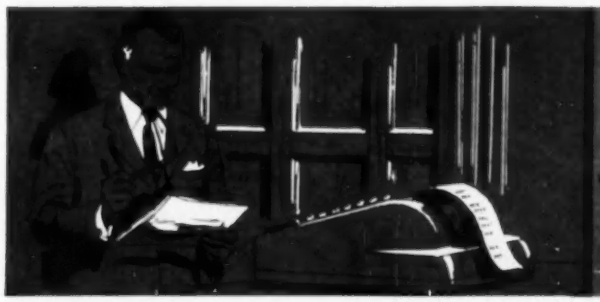


BIGGER PAYLOAD WITH BENDIX HYDROVAC* POWER BRAKES

Vacuum power braking helps the trucker to bigger payloads and more profit. Bendix Hydrovac, unchallenged leader in the field, weighs less, permitting increased payloads of up to several hundred pounds.

Get this continuing dividend when you order or specify truck equipment. Whether you build, buy, sell or operate trucks, you'll find it pays to ask for Bendix Hydrovac.

*REG. U. S. PAT. OFF.



PRICE—Hydrovac Power Brakes cost less to buy, less to maintain; do not rob power from the engine.

PROTECTION—Built-in standby safety . . . manual braking available in case of power failure.

More Bendix Hydrovac vacuum power brakes are in use than all other makes

Bendix PRODUCTS DIVISION South Bend, IND.

Bendix AVIATION CORPORATION

NEW ONE-OF-A-KIND MICROGRAPH

draws pictures for bearing research

This greatly magnified stylus is drawing a picture of the microscopic imperfections in a bearing raceway . . . measuring each one to within a few millionths of an inch. The picture-on-tape which comes out of this specially modified micrological instrument is an important tool in BCA's research on ball bearing performance.

This is just one of the precision instruments in the Temperature-Humidity-Controlled Instrumentation Room which is the center of BCA research on bearings. The result of this program is revealed in on-the-job performance of BCA bearings. They roll dependably under heavy loads and all kinds of adverse conditions.

New testing facilities at the BCA laboratories also include specially designed equipment, often identical with equipment in customers' plants. Here, BCA bearings are tested to exceed customer specifications *under the exact operating conditions experienced by the customer!*

BCA ball bearings are standard original equipment . . . replacement, too . . . for nearly every kind of industry. For example, automotive, earth moving, agricultural and machine tools. The wide line of ball bearing sizes and types, plus BCA's research and extensive new testing facilities, pays off for bearing users. Consider the performance record of BCA ball bearings the next time you purchase or specify bearings. For more information, or for assistance with bearings problems, contact Bearings Company of America, Division of Federal-Mogul-Bower Bearings, Inc., Lancaster, Pa.

BEARINGS COMPANY OF AMERICA

ball bearings

DIVISION OF
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BEARINGS, INC.

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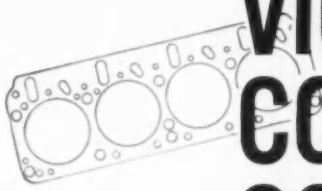


VICTOCOR® metal core asbestos-rubber

CORBESTOS® metal core asbestos

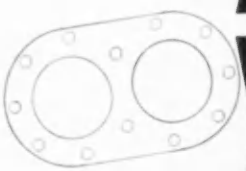
CORPAC® metal core rubber-asbestos

VICTOPAC® compressed asbestos-rubber

ASBESTOPRENE® beater mixed asbestos-rubber

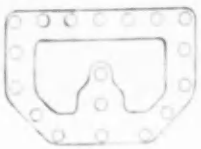
VICTOLEX® cellulose fiber-rubber

ASBESTOPAC® beater mixed asbestos-rubber



VICTORITE® glue-glycerine treated paper

ASBESTOCORK® asbestos-cork-rubber



VICTOCORK® cork-plant fiber-rubber

These names prevent misreading of your sealing specs

These are not ordinary brand names. They were coined to help specifiers positively and conveniently identify the intent of sealing design. They prevent misinterpretation of packing specifications.

Each name stands for a basic composition of packing materials (available in various grades) with controlled properties from lot to lot produced. Each name certifies to characteristics and performance values corresponding to the general SAE-ASTM classifications.

Sealing engineers increasingly are specifying packings by these names to insure performance and value.

A good man to know, your Victor Field Engineer is available for on-the-spot counsel on all sealing applications. His service, backed by Victor Home Office Engineers, is yours to use without obligation.

Victor Mfg. & Gasket Co., P.O. Box 1333, Chicago 90, Ill. Canadian Plant: St. Thomas, Ontario.

YOUR COMPLETE GUIDE TO PACKINGS

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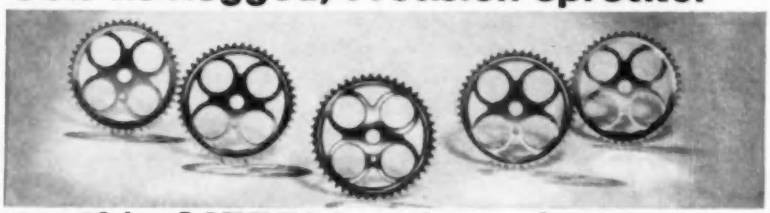
Sealing Products *Exclusively*

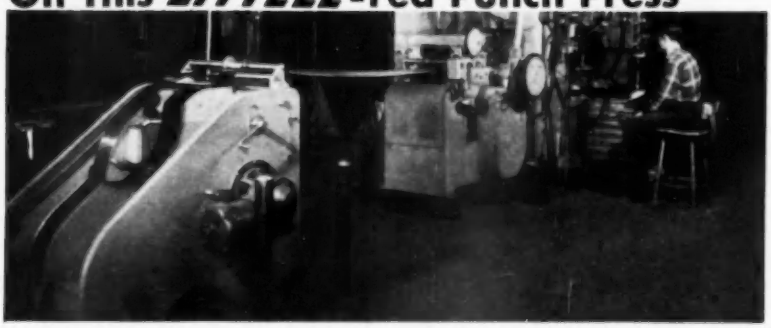
GASKETS • PACKINGS • OIL SEALS • MECHANICAL SEALS

The Schwinn Bicycle

Gets Its Rugged, Precision Sprocket



On This *LITTELL*-Fed Punch Press



Stamping out sprockets for famous Schwinn Bicyles is *precision* stamping. The special high strength steel stock is perfectly conditioned for accurate work. Flat stock, free of coil curvature, reaches the die area at perfectly timed intervals. For sprockets and other vital parts, Schwinn achieves this straightening-feeding precision economically, using the Littell "HRP" self-powered, hydraulically driven feeding and straightening machine. The "HRP" will serve you as well.

"HRP" is Versatile, Accurate, Convenient

The straightening-feeding cycle of the self-powered HRP unit is synchronized with the stamping cycle of the press by a single electrical connection. HRP units remove the coil curvature, and feed the straightened stock to the press or shear at precisely the desired speed. They feed from either side of the press, or from front to back. They can be positioned at special angles to produce specially shaped parts. Pulling an electrical plug disconnects the "HRP" from the press. Furthermore, the "HRP" can be easily moved from press to press by a lift truck. Facts in Bulletin B-10.

3 STANDARD "HRP" SIZES

STOCK CAPACITIES

12" wide x .090" thick
18" wide x .062" thick
24" wide x .050" thick

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"Get Bulletin B-10.
All facts. No charge."
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4111 N. RAVENSWOOD AVE, CHICAGO 13

CALENDAR

OF COMING SHOWS AND MEETINGS

ASME Production Engineering Conference, Milwaukee ..... May 17-19

ASME 32nd Annual Oil and Gas Power Conference, Kansas City May 22-26

Design Engineering Show, New York ..... May 23-26

ASME Summer Meeting and Aviation Conference, Dallas ..... June 5-9

SAE Summer Meeting, Chicago June 5-10

AGMA (Gear Mfrs.) Annual Meeting, Hot Springs, Va. ..... June 6-8

Material Handling Institute, New England Show, Boston ..... June 6-8

International Powder Metallurgy Conference, New York City June 13-17

International Trade Fair, Chicago June 20-July 5

1960 Western Packaging & Materials Handling Exposition, Los Angeles ..... July 19-21

11th Annual Industrial Research Conference, Harriman, N. Y. Aug. 7-13

American Astronautical Society, Western National Meeting, Seattle ..... Aug. 8-11

International Heat Transfer Conference, sponsored by ASME, American Society of Chemical Engineers, and IME, ICE (British) ..... Aug. 28 to Sept. 1

Machine Tool Exposition — 1960 (sponsored by National Machine Tool Builders' Assn.), Chicago Sept. 6-16

Production Engineering Show, Chicago ..... Sept. 6-16

ASME Engineering Management Conference, Cambridge, Mass Sept. 7-9

2nd Coliseum Machinery Show, Chicago ..... Sept. 7-15

Fall Meeting, Material Handling Institute, Virginia Beach, Va. Sept. 12-13

AWS, National Fall Meeting, Pittsburgh ..... Sept. 26-30

42nd National Metal Exposition and Congress, Philadelphia ..... Oct. 17-21

SPI, "Tooling for the Plastics Industry," New York City ..... Oct. 19

1960 Fleet Maintenance Exposition, New York City ..... Oct. 24-27

15th Annual Technical Convention, American Society of Body Engineers, Detroit ..... Oct. 26-28

ASTME, Western Tool Show, Los Angeles ..... Nov. 14-18

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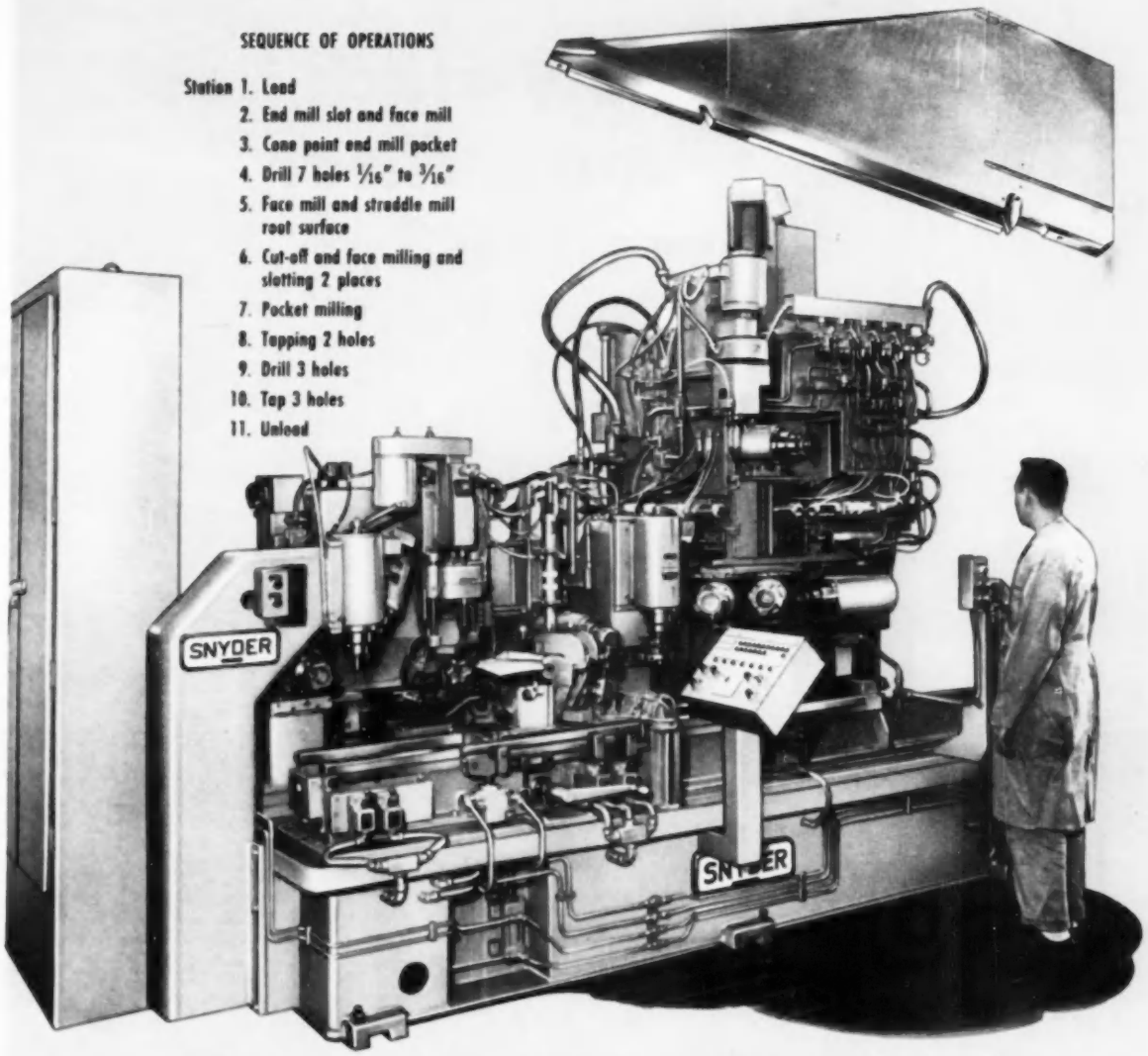
SEQUENCE OF OPERATIONS
Station 1. Load
2. End mill slot and face mill
3. Cone point end mill pocket
4. Drill 7 holes 1/16" to 3/16"
5. Face mill and straddle mill root surface
6. Cut-off and face milling and slotting 2 places
7. Pocket milling
8. Tapping 2 holes
9. Drill 3 holes
10. Tap 3 holes
11. Unload
SNYDER
SNYDER

COMPLEX MISSILE WING GETS 24 PRECISION OPERATIONS IN SPECIAL SNYDER PROGRAMMING TOOL

at Martin Company's Baltimore Division

Production rate, tolerances and part configuration dictated the fundamental design concept of this exceptionally compact tool which has 11 stations and performs 24 operations.

The cycle can be automatic, semi-automatic or manual. Controls for multiple cycle operations are provided by utilizing basic circuits triggered by a programming control device.

SNYDER
CORPORATION
(Formerly Snyder Tool & Engineering Company)

3400 E. LAFAYETTE—DETROIT 7, MICHIGAN
Phone: LO 7-0123

Circle 110 on Inquiry Card for more data

how much Dust can a filter collect?

UP TO 99.99%

if it uses WESTERN FELT!

Such efficiency is possible in a Hersey reverse-jet filter with particle size of 5 microns and a pressure drop of ½ inch of water.

Felt can be used to filter solids from solids, solids from liquids, or solids from gases. It is used effectively in fuel filters, air filters, chemical filters, respirators, or dust collectors.

Microscopic barbs on the live fibers of Felt make felt the ideal filtering medium. These scales collect and hold dust particles. They also encourage "build-up" or caking which actually increases filter efficiency. At the same time, their natural interlocking action holds fibers tightly together, through years of flexing.

For helpful engineering information on filtration felts, write

WESTERN Felt WORKS

Dept. A
4021-4139 Ogden Ave.
Chicago 23, Ill.

MANUFACTURERS AND CUTTERS OF WOOL FELTS

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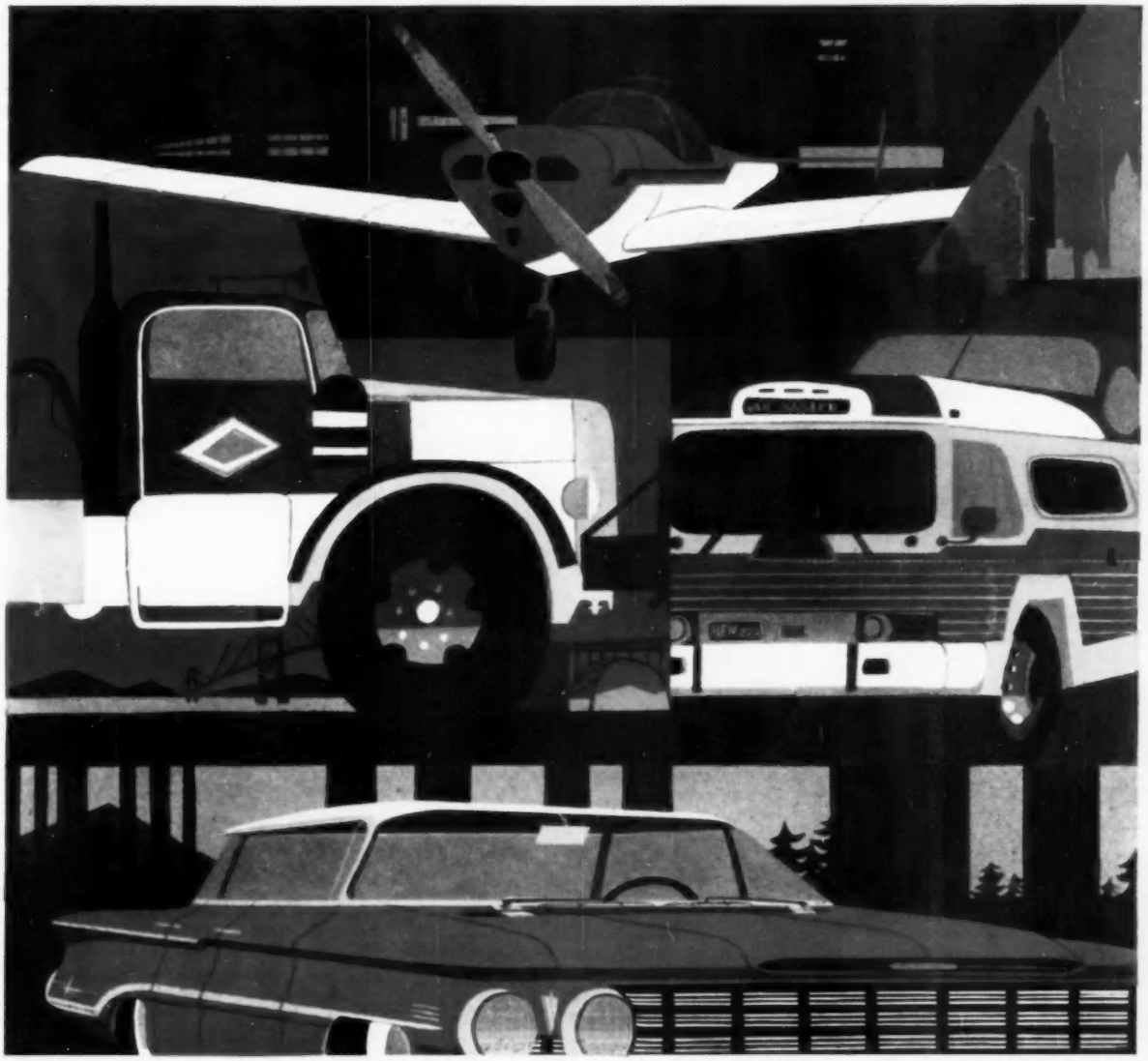
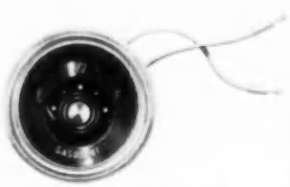


FUEL GAUGE PROBLEM? SEE AC!



AC's new, super-accurate, two-wire fuel or position indicator.

AC has been a foremost producer of fuel gauge systems since the day the fuel gauge on the dash replaced the yardstick under the seat. And AC has constantly pioneered the development of ever-more-accurate fuel level indicators.

The latest AC design is a two-wire gauge which provides pointer torque six times greater than a conventional high strength gauge through use of two wires and two coils, plus an improved magnetic circuit and a superior new electric circuit. The circuits employ features which substantially reduce temperature and voltage fluctuations. The pointer mechanism rides on nylon bearings for smooth actuation and precise movement.

The AC two-wire gauge provides a superior fuel indication method for automobiles, trucks, buses, light aircraft and marine—any liquid storage application where accurate knowledge of quantity is vital. It also may be employed in other uses—as an indicator of flap position on aircraft or of rudder position on ships, yachts and boats. This new AC gauge costs a trifle more than the conventional indicator, but its precision accuracy makes its small extra cost well worth while.

If you would like to know more about the AC two-wire gauge for original equipment use, or have any kind of fuel indicating or position indicating problem, a letter, wire or phone call to any of the AC offices listed below will get you prompt information.

AC Reliable Products Help You Sell

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ADHESIVE PROBLEMS SOLVED HERE

Here in the adhesives laboratory at Bridgeport, Conn., Raybestos-Manhattan engineers can solve even your most difficult adhesive problems quickly and economically.

R/M manufactures a wide range of Ray-BOND® adhesives. For special requirements, R/M will tailor special adhesives . . . designed to meet your particular manufacturing techniques, the demands of the materials you are using, and the service conditions of the product itself.

R/M offers these 7 basic classes of adhesives, coatings and sealers:

1. Heat-setting synthetic-resin adhesives, coatings and sealers
2. Cold-setting synthetic-resin adhesives
3. Heat-setting synthetic-resin, synthetic-rubber adhesives
4. Cold-setting synthetic-resin, synthetic-rubber adhesives
5. Rubber-base adhesives
6. Synthetic-resin sealants and coatings
7. Epoxy-base adhesives, coatings and sealers; casting, encapsulating and potting compounds

Take advantage of R/M's more than 20 years of experience in the production of bonded assemblies and the manufacture of adhesives, coatings and sealers. Why not call on Raybestos-Manhattan engineers today, without obligation, and ask them to prove how they can help you cut costs, speed production, and simplify fabrication and assembly operations.

R/M Bulletin No. 700 contains helpful engineering information on Ray-BOND adhesives, protective coatings and sealers. Write for your free copy.

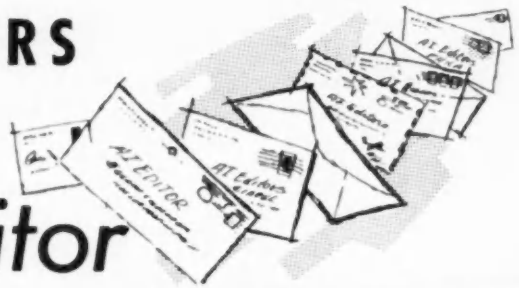
RAYBESTOS-MANHATTAN, INC.

ADHESIVES DEPARTMENT, Bridgeport, Conn. • Chicago 31 • Detroit 2 • Cleveland 16 • Los Angeles 58

RM

Circle 112 on Inquiry Card for more data

LETTERS to the Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

INTERNATIONAL STANDARDS

I particularly want to express my appreciation for the layout of the International Standards article which could not have been more effectively or attractively arranged.

Judging from the number of complimentary comments, letters and phone calls that I received, the article appears to have stimulated considerable industry interest in the objectives of the ISLC activities.

Harry C. Doane
Assistant Vice President of Engineering
Engineering Staff
General Motors Corp.
Detroit, Mich.

QUALITY CONTROL

I have just read your article in AUTOMOTIVE INDUSTRIES of April 1, on the subject of "Reliability Program" at Rochester Division of General Motors. It reminds me of how far the prestige of Inspection and Quality Control has advanced during recent years. I am sure you will recall a conversation we had during World War II when we both agreed that Quality Control was worthy of a Society of its own because it was only being handled as an unimportant part of the work of other National Societies. It has been pleasing to note the progress of the A S Q C in filling this gap.

After several months of vacation travel following my retirement at Pratt and Whitney Aircraft two years ago, I started to do special work for Kelsey-Hayes and I am still at it. My interest in Inspection and Quality Control continues and I hope to see more articles in current literature on these subjects.

E. S. Marks
Kelsey-Hayes Co.
Detroit, Mich.

CAR INTERIORS

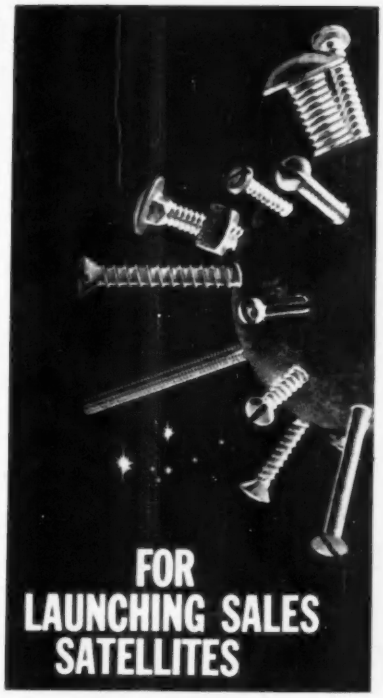
On my return from a somewhat extended trip, I have been reviewing issues of AUTOMOTIVE INDUSTRIES and was particularly interested in the item "Car Interior" in your February 15 issue. One of the tragedies in the modern automobile is the lack of space for tall people getting in and out of the car.

I am 6 ft 2 in. and I have no difficulty getting in and out of my 1954 Cadillac and my 1955 Chevrolet. During a stop in Colorado Springs, I had the use of a '58 Oldsmobile and could get into the car without difficulty, but under no conditions could I get out while wearing my hat. I tried various maneuvers at the risk of hurting my back but to no effect—the hat came off everytime.

I have been completely out of sympathy with the modern trend for longer, lower and wider cars, and the large tail fins give me a slight feeling of nausea. It is encouraging to have your comment on this subject and I also note some items in the April 1 issue of AUTOMOTIVE INDUSTRIES on page 17 saying that General Motors Plans Smaller Autos. This is wonderful news and I hope they go through with it with the entire line and also that they don't restrict themselves to merely overall length or overall width.

You and I live in cities with considerable traffic and difficult parking: the modern over-sized auto is a nuisance when used in conditions of this kind. I might end this plaintive note with a sincere desire to change in my outdated cars for something that will be a joy to drive and also to enable me to keep my hat in place when dismounting from my steed.

Francis W. Davis
Consulting Engineer
Motor Vehicles
Belmont, Mass.



STANDARDIZE 100% ON SOUTHERN FASTENERS

If you're making sales plans for a new model or new product soon to be launched into orbit, Southern fasteners will help assure its success.

Southern specializes in the manufacture of standard fasteners. Top quality materials and workmanship are combined to produce the most dependable production fastener your money can buy. Burr-free heads and durable threads help step up driving speed in assembly, and thus costly down-time, rejects and injured materials are reduced.

Order USA-made Southern fasteners today. Call your nearest Southern distributor, or write direct to factory: Southern Screw Company, P.O. Box 1360, Statesville, N. C.

Manufacturing and Main Stock in Statesville, North Carolina

WAREHOUSES:
New York • Chicago • Dallas • Los Angeles

Machine Screws & Nuts • Tapping Screws • Stove Bolts • Drive Screws • Carriage Bolts • Continuous Threaded Studs • Wood Screws

Southern SCREW COMPANY STATESVILLE • NORTH CAROLINA

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Thor

Everything you want in Air Hoists . . .

and more!

Put a 30 lb. air hoist to work for you which lifts over sixty times its own weight. Easily handled by one man. Infinitely variable speed control from dead slow to 50 ft. per minute lift, 96 ft. per minute descent (1000 lb. model). Pendent or pull-cord control. Hook or trolley mounting. Roller or link chain. Automatic disc brake. 500, 1000, 2000 lb. capacities. Other models to 3 ton capacity. Your Thor factory representative or distributor will demonstrate in your own plant. Thor Power Tool Company, Aurora, Illinois. Branches in all principal cities.

Thor POWER TOOLS

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THEY TRUST THEIR BABIES TO FRAM!

More manufacturers protect their precious new products with FRAM than with any other filters. See why:

The business reputation of an engine manufacturer is at the mercy of dirt and contaminants that ruin his products after they are sold. For fullest protection *in the field*, manufacturers install Fram *at the factory!*

When your equipment needs filter replacement it will pay you to use the filter manufacturers prefer—and assure yourself the most perfect preventive maintenance available today!

FRAM
OIL · AIR · FUEL · WATER
FILTERS

FRAM CORPORATION, Providence 16, R. I.

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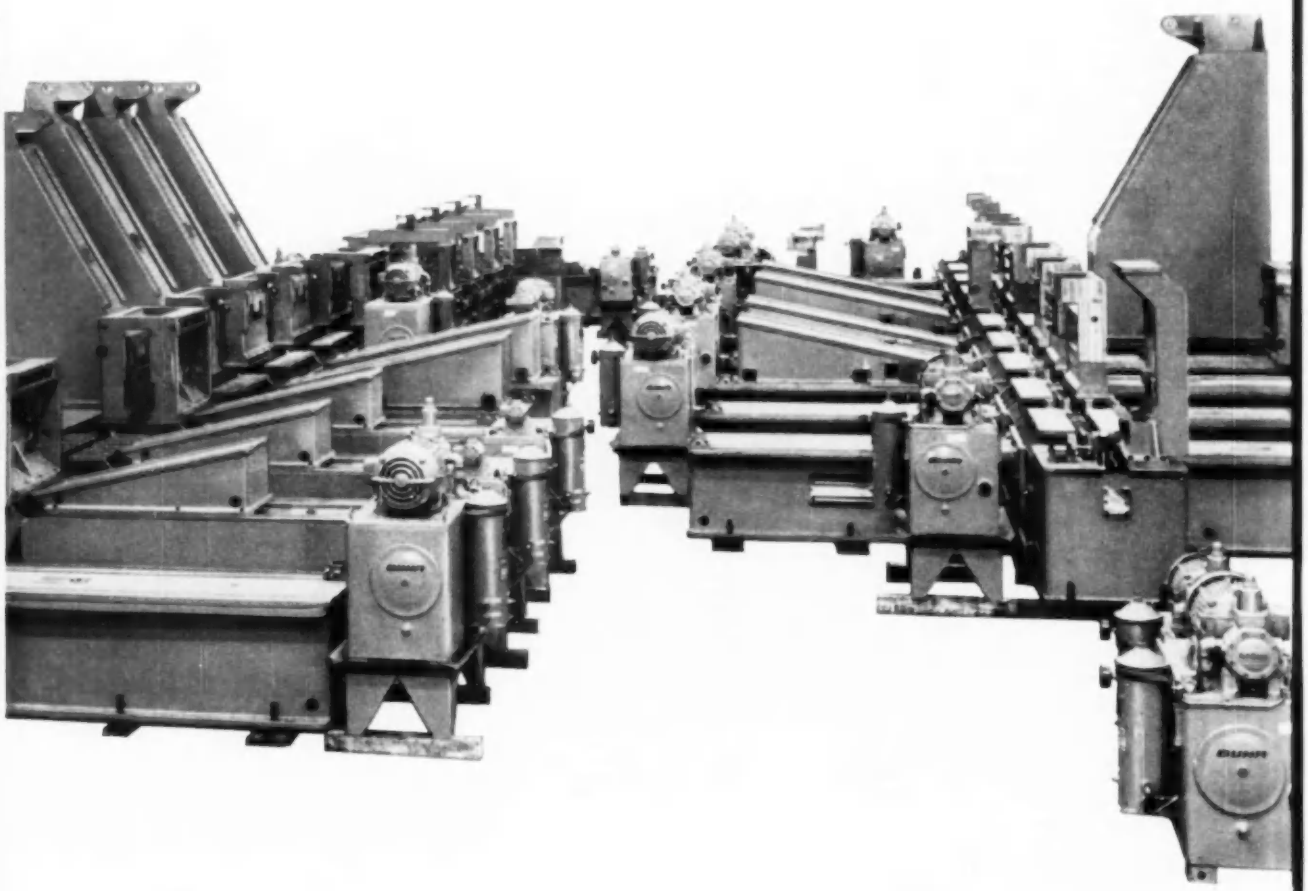
Report to the **SMTS*** *Committee*

*SPECIAL MACHINE TOOL STANDARDS

GESTATION PERIOD:



BUHR MACHINE TOOL COMPANY • ANN ARBOR, MICHIGAN

....everything's fine with BUHR'S "BABY"

Standard building block by standard building block, Buhr's Baby is fast taking shape. Wing bases, center bases and other standardized components are being assembled and made ready to receive special tooling and auxiliary features which are being completed.

Buhr's Baby, as you may know, is to be an Economatic lift-and-carry transfer—the first major piece of equipment to be built to the Special Machine Tool Standards. This "Baby" will perform 323 precision operations in automatic sequence and will be the most flexible and readily convertible multiple operation machine tool ever built.

BUHR

(say **BURE**)

ECONOMATIC

Circle 116 on postcard for more data

Automotively speaking... AMCHEM SPEAKS YOUR LANGUAGE!

Amchem service in automotive phosphating processes goes far beyond the sale of chemicals.

For instance, the Amchem "Technical Service Report" developed over 13 years ago has been adopted as virtually a standard form among leading automotive manufacturers. This monthly report incorporates all pertinent chemical and equipment performance data in one convenient form, has manifold advantages in keeping local and district management informed of line conditions for chemical control and maintenance, produces higher levels of quality through extra vigilance in controlling chemical baths and equipment.

In the past Amchem service has achieved significant advances in automotive prepaint finishing, among them—Deoxidine, the first corrosion-proofing treatment for use in mass production of steel automobile bodies; the first spray process for rust-proofing steel; and Granodine, the spray phosphating process that has become the accepted standard in industry.

Amchem has spent a lifetime (all 46 years of its corporate existence) providing phosphating services to the automotive field. If your requirements embrace more than phosphating chemicals alone, look to Amchem's Metal Protection Laboratories where, automotively speaking, we speak your language!

AMCHEM

AMCHEM PRODUCTS, INC.

(formerly American Chemical Paint Co.)
AMBLER, PA.

Detroit, Mich., St. Joseph, Mo., Niles, Calif., Windsor, Ont.

Amchem, Granodine and Deoxidine are registered trademarks of Amchem Products, Inc.

Armco ZINCGRIP Steel Seals Out *Rust*

Workable, zinc-coated sheet steel offers practical solution to corrosion of body parts.

Armco ZINCGRIP® Steel is *made* to serve where corrosion of sheet steels causes poor appearance or loss of strength. Automotive body panels and interior body parts are good examples.

ZINCGRIP is workable, too. You can draw, form, bend, punch, pierce. Its full-weight coating of zinc *stretches* with the base metal, does not flake or peel during the severest fabrication, and ZINCGRIP is weldable, too.

For almost a quarter-century, corrosion-resisting parts have been made from this special Armco Steel. For additional information, just fill in and mail the coupon or call your nearest Armco Sales Office.

New steels are born at Armco

ARMCO STEEL CORPORATION
1820 Curtis Street, Middletown, Ohio

Send more information on Armco ZINCGRIP Steel.

Name _____

Title _____

Firm _____

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City _____ Zone _____

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Use the STEELMARK to identify high-quality steels in the products you make.

Galvanized Steel

ARMCO STEEL

ARMCO

Armco Division • Sheffield Division • The National Supply Company • Armco Drainage & Metal Products, Inc. • The Armco International Corporation • Union Wire Rope Corporation

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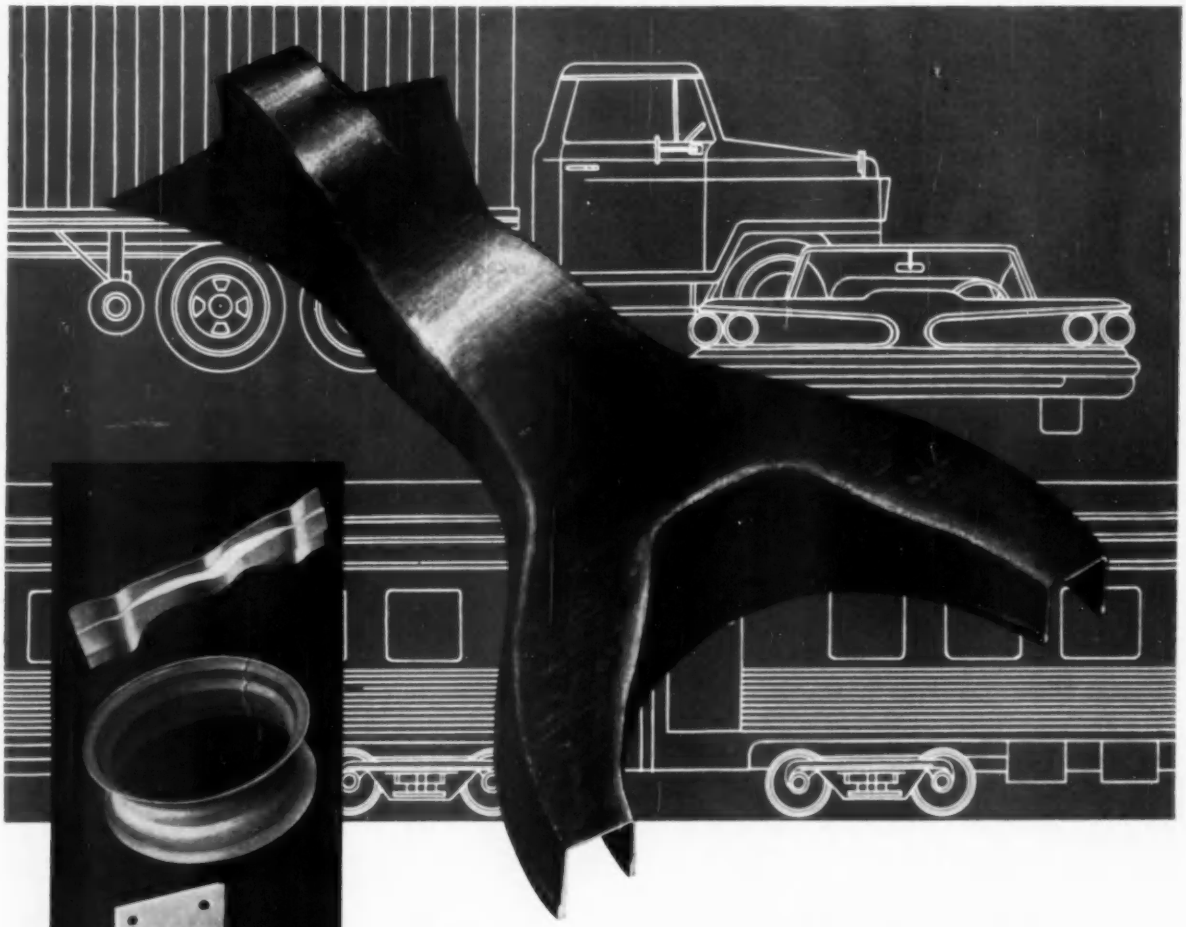
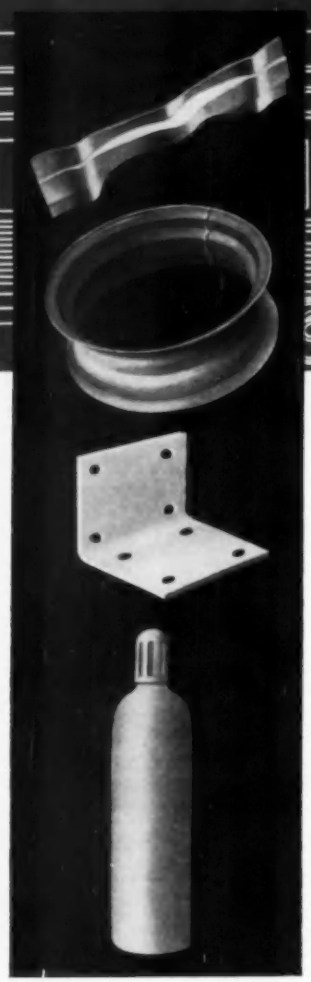




Columbium flat-rolled steels

Do you need a steel, to use in the "as rolled" condition? Or a steel which has high strength, good weldability, good formability?

More and more manufacturers are turning to columbium flat-rolled steel products, for columbium sheet, strip or plate gives an answer to all of these requirements.

Here are just a few examples of columbium steel's wide versatility. Line pipe for gas and oil offers ease of manufacture with excellent physical strength. Trucks, automobiles, farm implements, trailers and railroad cars take advantage of strength and ease of formability. Pressure vessels utilize the deep-drawing qualities of the steel. These applications and many others tell the story of columbium steel's versatility—and all with fewer rejects.

In the face of mounting manufacturing costs, columbium steels offer hope of effecting economies in producing your products. Ask any steel company for they can make it. Or ask us—we have a wide experience in its uses and knowledge of its manufacture.

MOLYBDENUM

2 Gateway Center CORPORATION OF AMERICA **Pittsburgh 22, Pa.**

Offices: Pittsburgh, Chicago, Los Angeles, New York, San Francisco
Sales Representatives: Brumley-Donaldson Co., Los Angeles, San Francisco
Subsidiary: Cleveland-Tungsten, Inc., Cleveland
Plants: Washington, Pa., York, Pa.

MCA

Want to cut costs on parts like these?

Here's how tracing will help you save

The simple, basic setup shown above handles nearly 300 different parts for a well-known manufacturer of drive line components. All work is performed on one Gisholt MASTERLINE No. 4 Ram Type Turret Lathe with a JETracer on the rear of the cross slide. Standard tools on the hex and square turrets are used to face, chamfer and reduce the stock while the JETracer finishes all diameters, steps, blends and radii. The $6^{3}/_{16}$"-long, 2"-diameter stepped shaft (above at left) is typical and is completed in two operations with total f.t.f. time only 4.95 minutes.

Here are just a few things the JETracer can do for you:

- **Shorten setup and change-over time**
- **Simplify machining and eliminate operator errors**
- **Save cost of form tools, multiple tool blocks and holders**
- **Reduce inspection time (only one length and one diameter need checking)**
- **Minimize or eliminate secondary operations (through finer finish, greater accuracy)**
- **Increase production through automatic machining of complex surfaces**
- **Free operator to handle extra units or perform other work**

Gisholt has developed a complete line of JETracers for use with ram and saddle type turret lathes, automatic turret lathes and single-spindle chucking lathes. These include rear cross slide, turret and independent slide mounted units, single or multi-pass types. *All are designed to operate at full capacity of the machines to which they are applied, without limiting machine functions or restricting the use of standard tools.*

You'll want to see for yourself how the JETracer adds flexibility, speeds operations and cuts costs on standard and problem parts. Send the coupon today for your free copy of the new JETracer catalog, or call your Gisholt Representative for complete information.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT MACHINES WITH NEW-MACHINE GUARANTEE

Gisholt Machine Company
1205 E. Washington Ave.
Madison 10, Wisconsin

Please send a copy of the new Gisholt JETracer catalog.

Name..... *Title*.....

Company.....

Street address.....

City..... *Zone*..... *State*.....

Circle 120 on Inquiry Card for more data

EVEN ON THIS EXTRA-TOUGH JOB...

N-A-XTRA

HIGH-STRENGTH STEEL TRIPLES TRUCK LIFE!

Hour after hour, around the clock, the Edward C. Levy Slag Company, Detroit, keeps forty 45-ton trucks working under severe conditions. Nearly 30 tons of hot slag are loaded, lifted and dumped on every trip. Each time, the truck body must stand the sudden shock of drop loading, the stress of lifting that load and the grinding abrasive action as it empties.

How long can a truck body take such a beating?

Until the company (which designs its own trucks) discovered N-A-XTRA high-strength steel, they used ordinary carbon steel, good for about 18 months' service. Though the truck bodies were as strong as they could be and still carry an adequate payload, maintenance was almost continuous—with breaks, dents, dings and sags occurring almost from the start.

Then they fabricated eight bodies out of N-A-XTRA, which has a minimum yield strength nearly three times greater than mild carbon steel. These trucks carry the same payload and after 18 months' service still look almost new. Owners estimate a life of five years, more than triple the others—with far less maintenance. The extra strength of N-A-XTRA also permits a strong floor that needs no expensive reinforcement to support the load against hydraulic lift action.

Eventually, all forty Edward C. Levy trucks will be made of N-A-XTRA high-strength steel. In fact, all patches and section replacements are now made with N-A-XTRA.

Tons of hot, abrasive slag may not be your problem—but the same steel that mastered these conditions is the one to remember when only the strongest steels will do. Rugged conditions, heavy loads and weight-saving construction are challenges that N-A-XTRA is designed to meet and beat. With excellent weldability, formability and toughness, these quenched and tempered N-A-XTRA steels are available in four levels of minimum yield strength, from 80,000 to 110,000 psi. They can also be supplied to higher levels of mechanical properties.

Dramatic contrast! Compare above truck interior of N-A-XTRA high-strength steel with the mild carbon steel body and its reinforced floor.

N-A-XTRA

A PRODUCT OF

GREAT LAKES STEEL

Detroit 29, Michigan

These two trucks have done the same tough work for 18 months. The only difference is that the one above is made of N-A-XTRA.

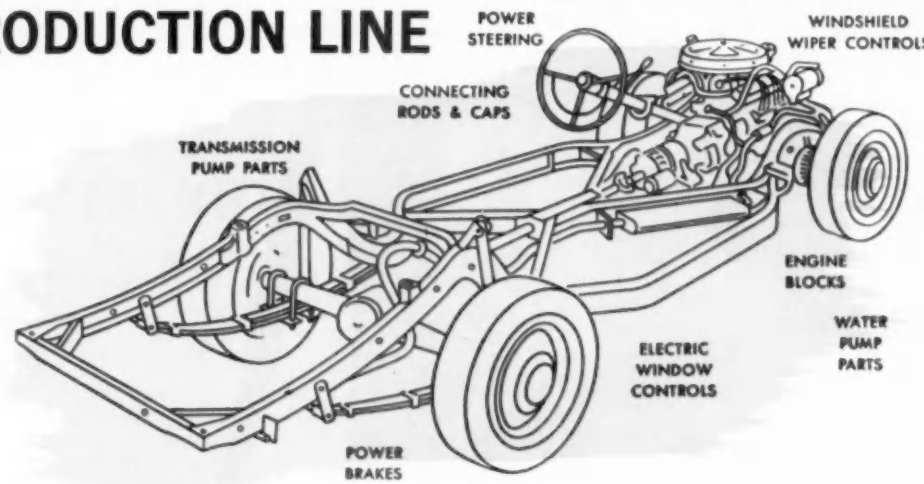
DESIGN NOTE:

Panels and floors for these trucks, designed by Edward C. Levy Slag Co., were fabricated of N-A-XTRA 100 (100,000 PSI minimum yield strength) from plates 5/16"-1/2" thick. Standard flame cutting procedures were used. Side frames were cold-formed of N-A-XTRA 100 from 5/16" plate, using both skip (6" weld, 6" skip) and continuous welds. Performance to date has been equal, indicating additional savings through skip welding.

For full technical information on N-A-XTRA high-strength steels, write Great Lakes Steel Corporation, Detroit 29, Michigan, Dept. J-9.

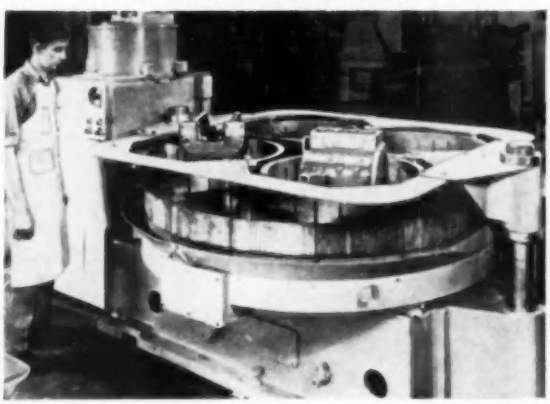
***Great Lakes Steel is a Division of* NATIONAL STEEL CORPORATION**

HOW PRODUCTION LAPPING WITH THE LAPMASTER FITS INTO THE AUTOMOTIVE PRODUCTION LINE



There are many money-saving reasons why machine lapping with the Lapmaster has become an important, and in many cases a necessary, operation in the production of automobile parts, from large engine blocks to small water pump impellers. For instance:

A GOOD EXAMPLE



Production lapping of two surfaces on 4-cylinder engine blocks on a Model 72 Lapmaster, provides a gasketless oil seal at the oil pan juncture and a gasketless compression seal between head and block.

There is no other production way of finishing parts to a flatness of .0000116″ or less with a micro-inch finish of 2 to 3 RMS with absolute uniformity, piece-after-piece.

Normal warpage in aluminum alloy castings easily removed to provide flat surfaces for the accuracy required in subsequent operations. Warpage resulting from clamping or chucking during previous milling and grind operations is also economically removed with the Lapmaster.

Substantial production savings are also possible because lapping eliminates need for deburring, finish grinding or milling operations and permits use of increased milling speeds.

In small lots or thousands per day, production is not interrupted or slowed down for replacing or reconditioning lap plates because Lapmaster conditioning rings automatically keep lap plate flat.

New Catalog Tells More

If flatness, parallelity or a precision finish is a problem in your production process, find out how Lapmaster is saving others money. This 24 page catalog includes technical data, specifications, tooling set-ups and actual production case histories. Send for a copy.

Lapmaster®
...THE MACHINE THAT PUT PRECISION LAPPING ON A PRODUCTION BASIS

A product of

Crane Packing Company

6435 OAKTON ST. • MORTON GROVE, ILL. (Chicago Suburb)

In Canada: Crane Packing Company, Ltd., Hamilton, Ont.

Circle 122 on Inuiry Card for more data

PICK A NAME—ANY NAME...

You can benefit—as they have—from the experience behind Zenith® Carburetors

Yes, our experience can be of great value to you. Zenith has designed and built carburetors for more different types of equipment than any other manufacturer. Our background is "heavy" in both gasoline and LP. It includes trucks, tractors, buses, stationary engines, off-the-road equipment, boats and even fire engines.

Let us help with your applications by drawing from our extensive reservoir of problem-solving experience. Jot down the salient features of your current requirements and call us for a recommendation. Write to Zenith Carburetor Division, 696 Hart Avenue, Detroit 14, Michigan.

Zenith Carburetor Division
Detroit 14, Michigan

Bendix
AVIATION CORPORATION

Circle 123 on Inquiry Card for more data

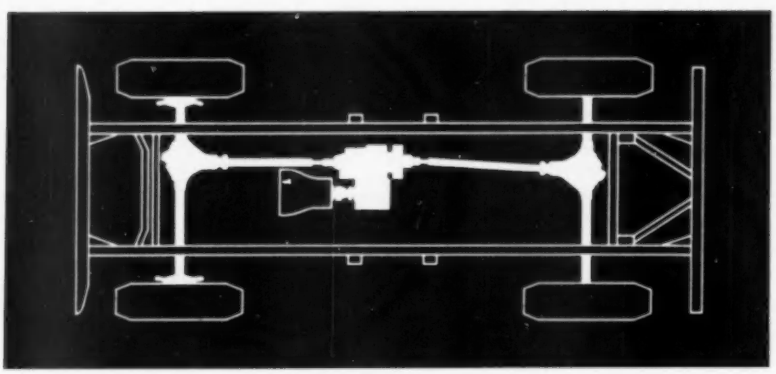
With Power-Matched Your Trucks Will Lick

Only Spicer provides the operating advantages of power-matched design, because only Spicer designs and manufactures *complete* 4-wheel drive assemblies for light and medium-duty trucks. The Spicer name on both front and rear driving axles, transfer case, drive shafts and universal joints means maximum power and efficiency.

Specify Spicer for 4-wheel drive units, for maintenance-free performance, and for immediate parts availability—anywhere in the country!

Spicer front drive axles have been job-proven by over a quarter-century of rugged use in both civilian and military vehicles.

Special Spicer rear axle design and construction assure precision alignment of gears and bearings at all speeds and load conditions for quieter operation.



Power-Matched . . . Spicer *complete* four-wheel drive assemblies are designed to work together for dependable, full power traction.

Spicer 4-Wheel Drives The Toughest Terrain!

WRITE *Dana for further information on 4-wheel drives. Please describe your application and include load data.*

DANA Spicer

DANA CORPORATION

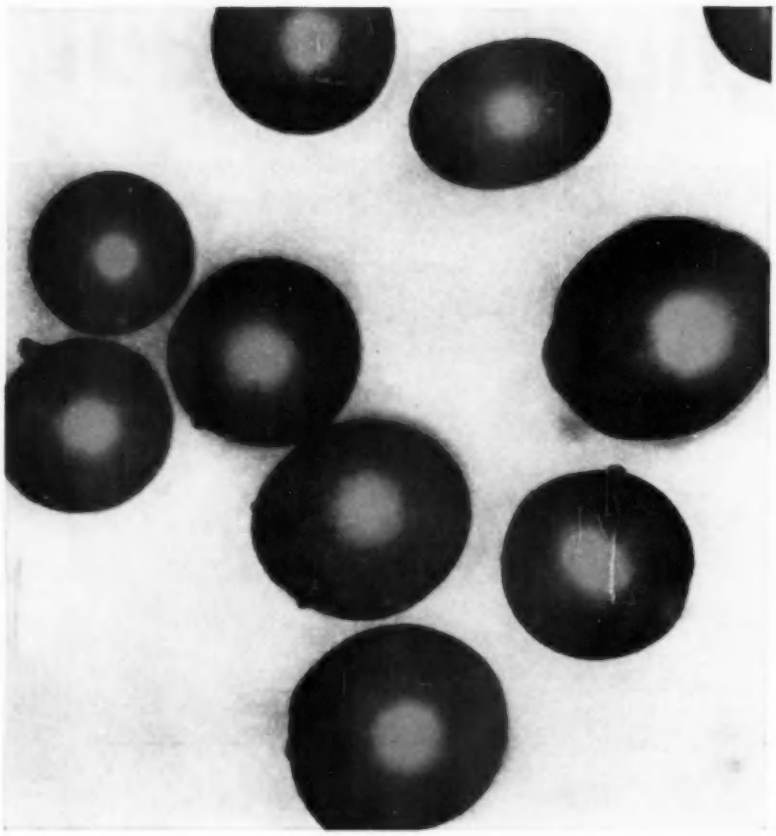
Toledo 1, Ohio

Serving Transportation—Transmissions • Auxiliaries • Universal Joints • Clutches • Propeller Shafts • Power Take-Offs
Torque Converters • Axles • Powr-Lok Differentials • Gear Boxes • Forgings • Stampings • Frames • Railway Drives

Many of these products are manufactured in Canada by Hayes Steel Products Limited, Merritton, Ontario

Circle 125 on Inquiry Card for more data

30 MILLION OF THESE JET-FORMED SPHERES IN EVERY INCH OF BEARING SURFACE!



JET PROCESS BLASTS MOLTEN ALLOY INTO UNIFORM PARTICLES . . . so small that thirty million will form a thin layer only one inch square! This sintered layer is the bearing surface of Federal-Mogul sleeve bearings.

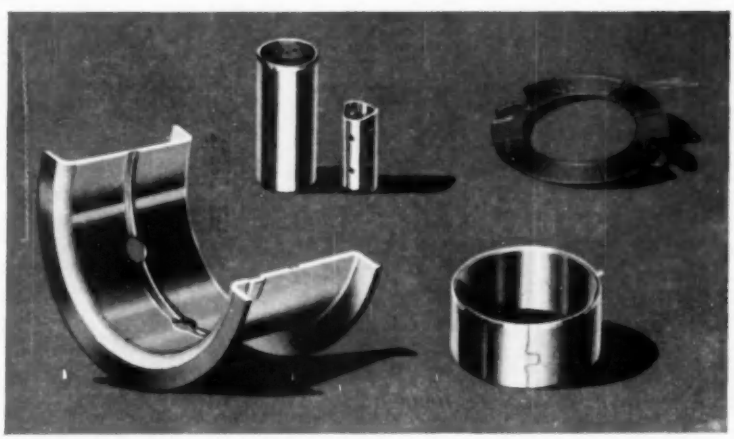
Molten copper-lead, alloyed to exact specifications, is poured into a special inert-atmosphere reaction crucible. Here it's blasted by a high-speed fluid jet to form the dense powder shown at left.

Because of the uniform particle size of this powder, the bearing surface of each F-M copper-lead sleeve bearing has precisely the same alloy composition and high adhesion to the steel backing as every other F-M bearing of the same alloy type!

YOU CAN SEE THE CONSISTENT SIZE in the photomicrograph. What you *can't* see is the consistent alloy composition which produces uniform bearing properties and performance in any alloy type.

Federal-Mogul makes engine bearings for every condition of speed and load. You can select from among five different sintered copper-lead alloys, all permanently bonded to precision-formed steel backing. Our Engineering Department is available to you for consultation or recommendations on bearing design and application. For more information, write Federal-Mogul Division, 11037 Shoemaker, Detroit 13, Michigan.

FEDERAL Mogul



A COMPLETE LINE! Steel backed bearings with a selection of many different alloys for virtually any bearing application—Plain and bimetal bushings in bronze, steel or aluminum. Precision thrust washers in solid bronze, or sintered alloys on steel (one or both faces). Rolled split spacer tubes in steel, aluminum or stainless.

FEDERAL-MOGUL

sleeve bearings
bushings-spacers
thrust washers

DIVISION OF
FEDERAL-MOGUL-BOWER
BEARINGS, INC.

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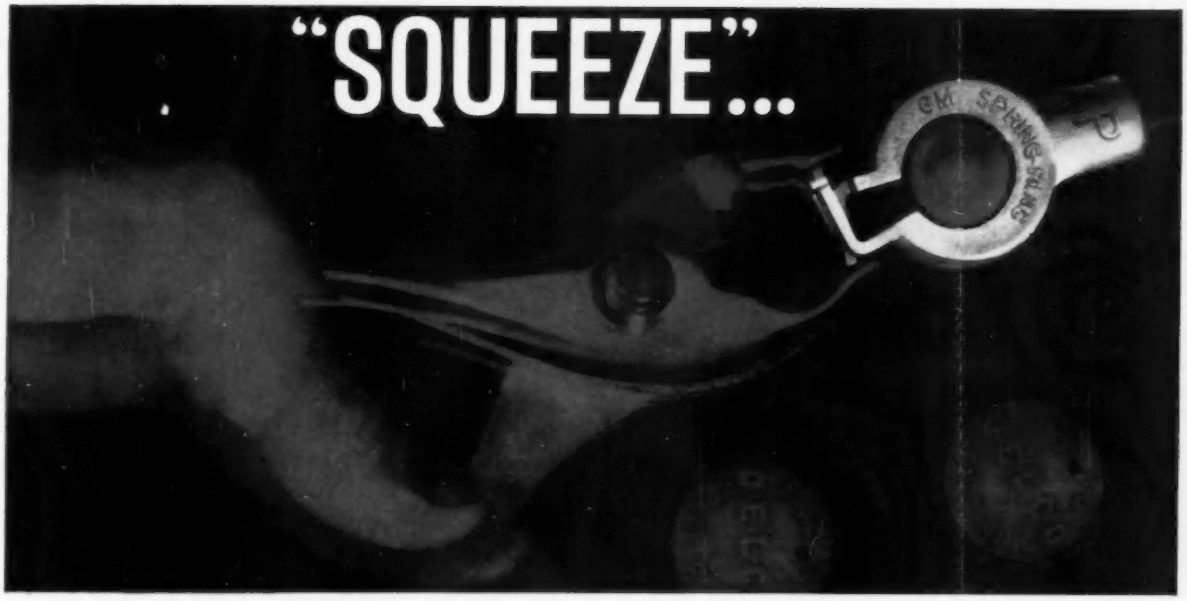

...and it's on!

Packard "SPRING-RING" Battery Cable Saves Time

Packard "SPRING-RING" battery cables require no special tools for installation. A pair of pliers . . . a squeeze on the tangs . . . and they are on, providing a high-pressure contact. • Available for both positive and negative battery posts, "SPRING-RINGS" are smaller than conventional terminals so there is less chance of interference with battery filler caps and hold-downs. • Because they offer so many advantages, Packard "SPRING-RING" terminals are original equipment on many 1960 General Motors cars. For full details contact Packard Electric today. Branch offices in Detroit and Chicago.

Packard Electric

Warren, Ohio

GM GENERAL MOTORS

"Live Wire" division of General Motors

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Spray, dip, or flow coating . . .

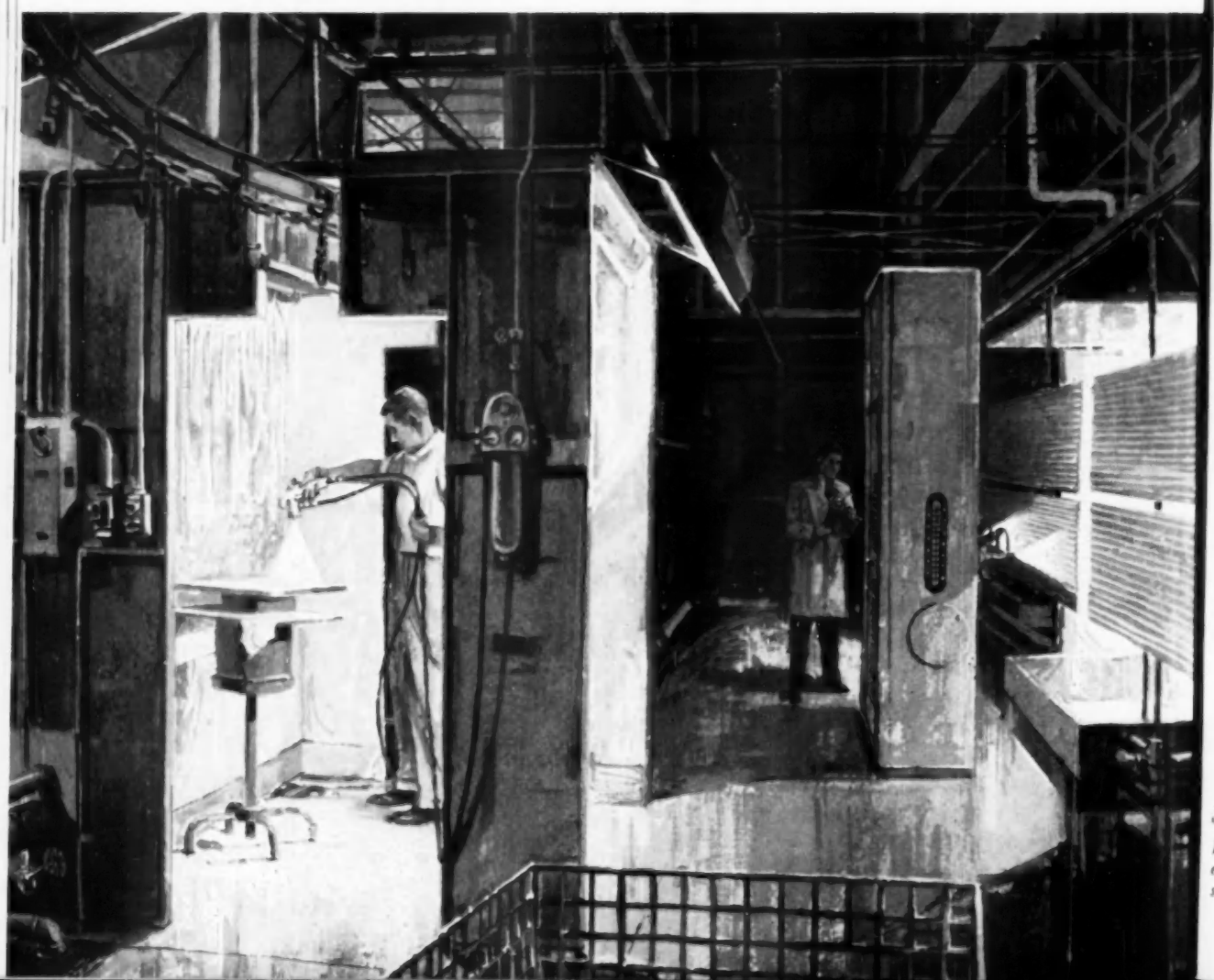
DeVilbiss total

can help determine the best method for you

Large job or small, you get an unbiased recommendation from DeVilbiss for the coating method that will work best for you. For, DeVilbiss is the only company that manufactures a complete line of coating equipment—from individual spray guns to engineered finishing systems.

Trained engineers provide total service from initial planning to complete training of operational personnel. Furthermore, our customer research laboratory will run comparison tests of your products for actual results that reveal what method is best for you. Or DeVilbiss engineers will suggest ways to make your present system more efficient with minimum changes, and on-the-job operator training.

See how DeVilbiss total service can help you. Just contact our nearest representative or write: The DeVilbiss Company, Toledo 1, Ohio. Also Barrie, Ontario; São Paulo, Brazil; and London, England. Branch offices in principal cities.



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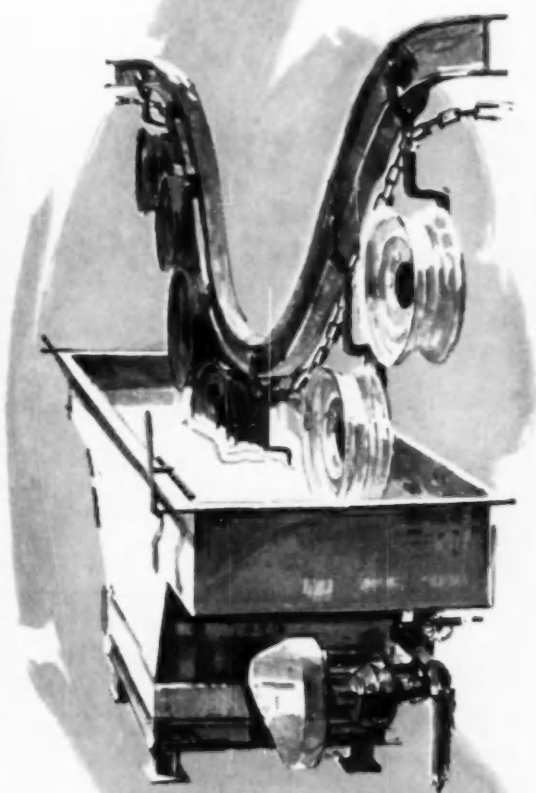
shape

service

FOR TOTAL SERVICE, CALL

DEVILBISS



Dip coating *Continuous process or batch type, with scientific vapor and viscosity controls to ensure uniform finishes*

Flow coating

Saves man power, floor space in prime- or single-coat applications

Spray coating

DeVilbiss manual and automatic equipment coats products of any size or shape quickly, economically

Circle 127 on Inquiry Card for more data

if your twin problems are

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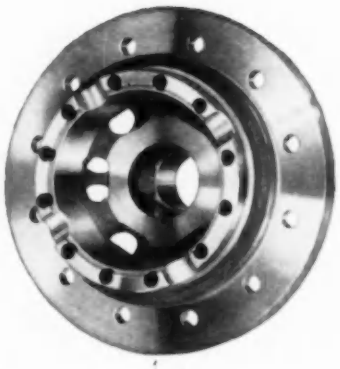
product improvement

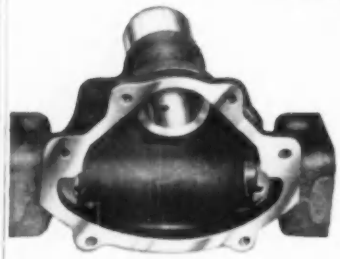
and

cost reduction

NATIONAL HTM CASTINGS

are the answer





HTM is strength . . . toughness . . . wear and fatigue resistance . . . non-seizing. HTM is higher machinability than B1112 steel . . . it's closer as-cast tolerances that can reduce or wipe out machining operations.

If you're reappraising your product from a competitive point of view . . . if you're looking for production economies—look into HTM castings. Yes, HTM is many things—and it's just made to order for many mass-produced products just like yours.

A-1151A

HTM (Pearlitic Malleable) is many things—and they all add up to a *better product at lower finished cost.*

NATIONAL MALLEABLE and STEEL **CASTINGS COMPANY**

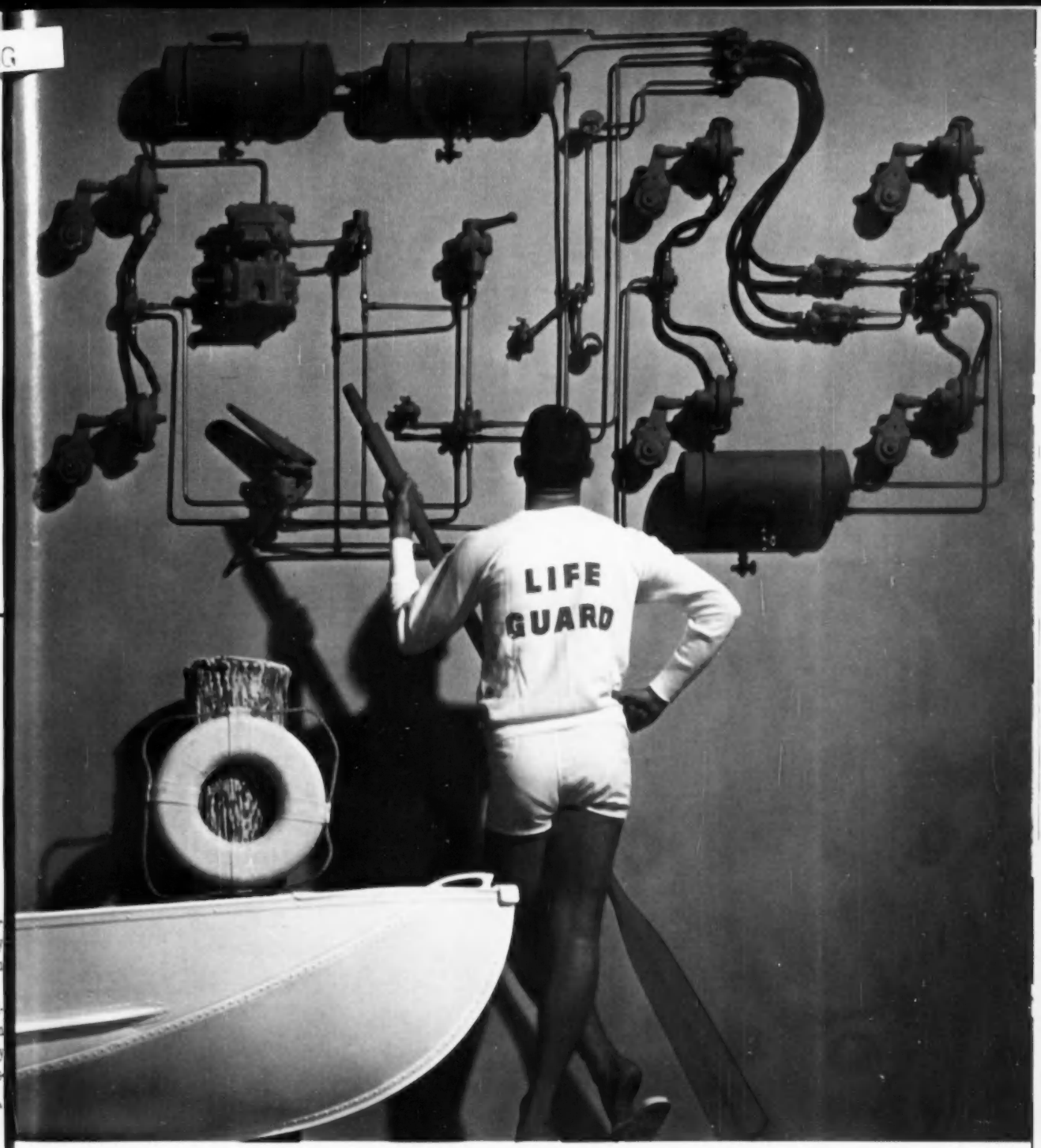
Established 1868 *Cleveland 6, Ohio*

MEMBER MALLEABLE CASTINGS COUNCIL

The nation's largest independent producer of malleable and pearlitic malleable

Circle 128 on Inquiry Card for more data

Circle 129 on Inquiry Card for more data



"SYSTEMATIC" SAFETY . . . at the beach, the lifeguard follows a planned system in protecting lives. On the highway—or off the road—it's air brake systems by Bendix-Westinghouse that guard the lives and loads aboard transport vehicles. Because these air brakes are system-engineered, they provide surer safety . . . plus utmost economy and dependability. For these reasons, the nation's fleet operators and vehicle manufacturers specify complete air brake systems from Bendix-Westinghouse. When it comes to new vehicles, these systems are your assurance of best all-around braking performance.

SPECIFY COMPLETE AIR BRAKE SYSTEMS BY *Bendix-Westinghouse*

2,200,000 Bendix-Westinghouse Compressors

PROVED DEPENDABLE OVER HUNDREDS OF BILLIONS OF MILES

On April 6, 1960, the 2,200,000th Bendix-Westinghouse compressor passed its final factory tests. As the "heart" of a complete Bendix-Westinghouse air brake system, it was ready to join its 2,199,999 predecessors in providing consistently efficient, dependable stopping power.

Bendix-Westinghouse compressors have been proved in use over *hundreds of billions of miles* on all kinds of commercial vehicles, in every type of service, under all conditions of weather.

Today, the design and engineering experience gained in this vast, practical proving ground benefits *every* user of Bendix-Westinghouse compressors. Three basic models meet the needs of all sizes of commercial vehicles: Tu-Flo 300—for lightweight trucks and school buses; Tu-Flo 400—most widely used by over-the-highway haulers; Tu-Flo 500—for large city and interstate buses, off-the-road vehicles and heavy-duty trucks.

Continue to specify Bendix-Westinghouse Tu-Flo compressors. You can always be confident of their performance-proved safety, economy and dependability!

Bendix-Westinghouse

AUTOMOTIVE AIR BRAKE COMPANY

General offices and Factory—Elyria, Ohio. Branches—Berkeley, Cal., and Oklahoma City, Okla.

where moisture
and abrasion
meet brightness
that never wears out
sink frames of
Superior
STAINLESS STRIP STEEL
At the toughest spot in the kitchen, Superior Stainless shows its metal best . . . the ever-bright, smooth gleam that asks no more than a wipe to reflect a housewife's pride. • Solid Superior stainless sink frames fabricate uniformly well because composition, dimensions and temper are uniformly as specified, every time. • We can serve you exactly as you wish. Ask us!
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LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY

4 good reasons why you should use IRIDITE®

Chromate Conversion Coatings

ON YOUR ZINC OR CADMIUM PRODUCTS

CORROSION PROTECTION

The wide range of Iridite coatings available gives you a choice of corrosion protection—from economical, mild protection of parts for shipment, storage or display, to extremely high protection under exposure to marine and highly humid atmospheres, gasoline or other hydrocarbons.

PAINT BASE

For an extremely tight bond for either baked or air-dried paints, non-porous Iridite blocks moisture penetration—prevents formation of metallic soap products beneath paint coatings.

APPEARANCE

Your choice of colors ranging from clear through yellow iridescent to olive drab. Bright Iridite finishes can also be dyed to provide other color effects.

SPECIAL EFFECTS

Iridite, in combination with other Allied Research processes, can provide a wide variety of finishes. As an example, Iridite 8-P applied to zinc or cadmium, followed by an application of Irilac, gives a highly attractive simulated brass finish.

IRIDITE—a specialized line of chromate conversion coatings for nonferrous metals. Easily applied at room temperatures with short immersion times, manually or with automatic equipment. Forms a thin film which becomes an integral part of the metal. Cannot chip, flake or peel. Special equipment, exhaust systems or highly trained personnel not required.

For complete information on Iridite, contact your Allied Field Engineer. He's listed in the yellow pages under "Plating Supplies." Or, write for FREE TECHNICAL DATA FILES.

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Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment, and Supplies for Metal Finishing

IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment

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Circle 131 on Inquiry Card for more data

NEWS

Vol. 122, No. 10

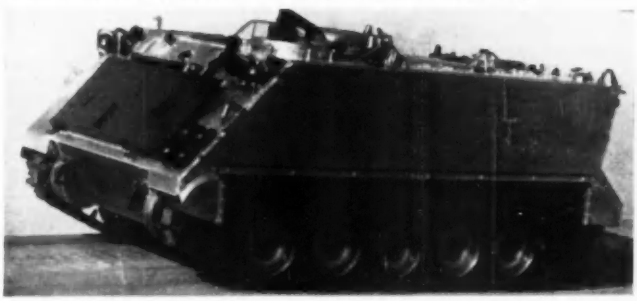
May 15, 1960

Army Displays New Mobile Might

By Hartley W. Barclay, Editor and Publisher
and C. B. Campbell, News Editor

Four pages of photo highlights of Project MAN, the Army's exhibition of latest equipment

M-113 aluminum armored personnel carrier is speedy, amphibious vehicle that carries fully equipped infantry squad of 10. Weighing nine tons, it can be transported by air and parachute dropped. Manufactured by Food Machinery and Chemical Corp.



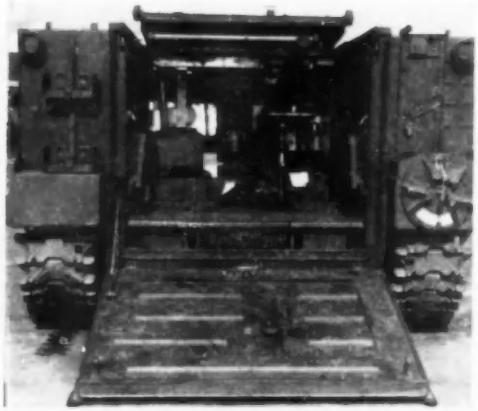
Star of display was M-60 tank. It carries 105mm cannon. New 750 hp diesel engine provides 40 per cent more range.

Cross-country mobility for Pershing missile is provided by XM474E1 lightweight equipment carrier. Four vehicles can carry entire system.

Among the newest vehicles was the rugged XM-408, experimental three-quarter ton truck that resembles renowned "Jeep." It has 40 hp engine and four forward speeds.

Radio-operated remote control Hyster tractor knocks down obstructions delaying front line infantrymen and paves way for their advance. Tractor could level wrecked buildings and pillboxes in which enemy snipers hide.

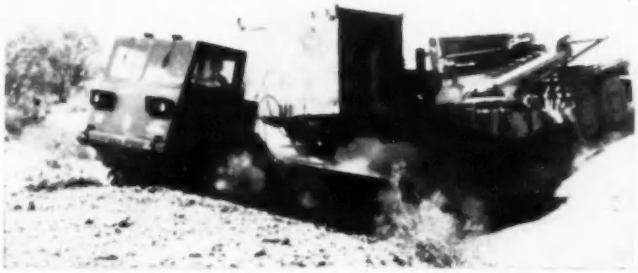
GI Equipment Stresses Mobility, Amphibious Use



The M-84 is the first mobile mortar carrier. All-steel, amphibious armored vehicle mounts 4.2-in. mortar. It does 40 mph and has 200 mi range.

Chrysler's XM-410, eight-wheel drive, 2½-ton cargo truck with unitized, hull-type body, has cross-country mobility and can be parachuted from plane. In lower photo XM-410 crosses lake during training exercise. It weighs 4000 lb less than today's trucks.

New type of amphibious craft, the all-aluminum LARC-5, a five-ton cargo lighter, climbs beach after taking on supplies from ships anchored in deep water. A product of Borg-Warner, it is powered by Ford V-8, 535 cu in. engine.



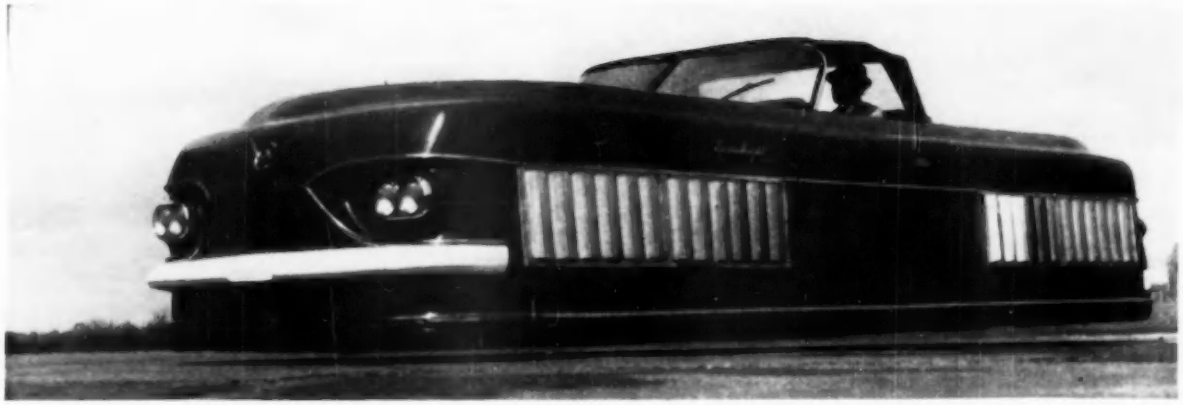
U. S. Steel's new, light-gage "T-1" alloy steel gives Sergeant missile's erector-launcher the strength to take rugged abuse. At the same time, the equipment is light enough to be airlifted.

Front line nuclear punch is assured by Davy Crockett weapons system. Army Secretary Wilber M. Brucker says it "dwarfs in firepower anything we have known." Nuclear warhead's radius would not endanger U. S. troops or friendly civilians.

Mounted on Willys' Mechanical Mule, 106mm recoilless anti-tank rifle can go into action just behind front lines with a minimum of delay. Mule has four-wheel drive and four-wheel steering and can negotiate almost any kind of terrain.

Steep hill is no problem for prototype XM443E1. Driven by 100 hp air-cooled engine, it can be quickly converted from personnel carrier to truck. It is larger version of Mechanical Mule.

Big brother of the LARC-5 is the LARC-15. It has 15-ton cargo capacity and travels in water at 10 mph. Powered by two 270 hp Ford engines.



Air-Car, by Curtiss-Wright, travels on cushion of air over unobstructed land, water and swamps. It is powered by two 180 hp engines. Two axial flow fans provide air for suspension, propulsion and braking.

Another truck undergoing rigorous tests at Fort Benning is this experimental 2½-ton vehicle. It has maximum speed of 55 mph, weighs 8800 lb, and will float.

Steep hills are easy for Mechanical Mule. Half-ton weapons carrier weighs only 900 lb but can carry 1000-lb load up 60 per cent grade.

NEW
ACTUALLY 3 SPRINGS IN ONE!
As shown in this enlargement, the tri-coil spring is composed of 3 integrated coils. The spring's amazing strength and durability are the result of this triple-coil design.

HEAVY-DUTY OIL RING WITH

TRI-COIL OFFSET SPRING

solves tough oil control problems—
and only Perfect Circle has it!

Exclusive new Perfect Circle tri-coil spring has maximum area of contact with the ring all the way around—provides more uniform pressure than an ordinary hump-type expander. This results in higher cylinder conformability with less friction.

And, the stainless steel spring is offset in a channel next to the ring slots, rather than being directly behind them. Ventilation is greatly increased, and clogging of the ring and spring is reduced to a minimum.

Heat stability and easy installation are two more of the many more outstanding features of the new Perfect Circle OS 89. Get complete information from your Perfect Circle representative today!

PERFECT CIRCLE

PISTON RINGS • PRECISION CASTINGS
POWER SERVICE PRODUCTS • SPEEDOSTAT

Hagerstown, Indiana — Don Mills, Ontario, Canada

Circle 132 on Inquiry Card for more data

There's almost no limit to the things Bundy can mass-fabricate

Bundyweld is the only tubing double-walled from a single copper-plated *steel* strip, metallurgically bonded through 360° of wall contact for amazing strength, versatility.

Bundyweld is lightweight, uniformly smooth, easily fabricated. It's remarkably resistant to vibration fatigue; has unusually high burst strength. Sizes up to ⅝" O.D.

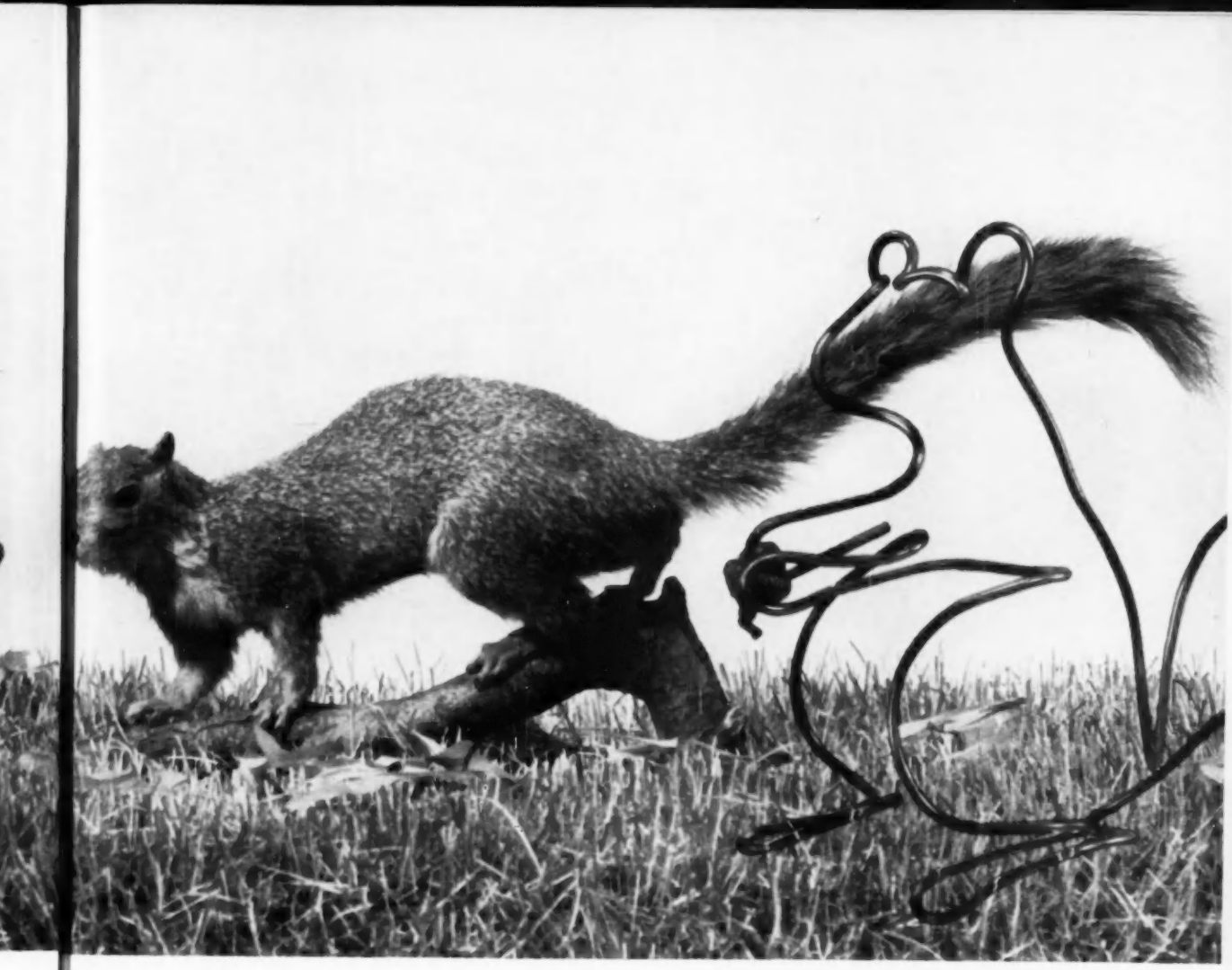
Maybe your tubing problems don't run to animal shapes, but it's likely that you can benefit from Bundy's experience in mass-fabricating complex tubing parts. Here's why:

Precision bending: Bundy-developed machines turn out parts to exacting customer specifications . . . *with mass-fabrication savings.*

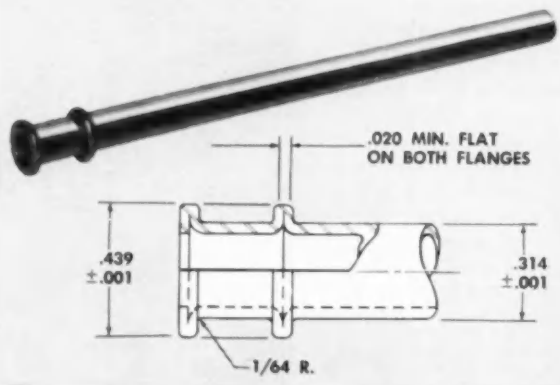
Great strength: Your component will be fabricated from Bundyweld®, the copper-brazed steel tubing that's *double-walled* from a single steel strip. Bundyweld, the tubing standard of the automotive industry, is used in over 95% of today's cars.

Expert design service: You can call on our engineering staff at any time to help with the design of your product. We may be able to point out short cuts that save you money without compromising engineering standards. Covered by Government Spec. MIL-T-3520, Type III.

Next time you have a tubing problem, better call Bundy *first.* Phone, write, or call Bundy Tubing Company, Detroit 14, Michigan.



This oil transfer tube illustrates the precision with which parts are mass-fabricated at Bundy. Two flanges are formed on the Bundyweld tube as shown in the diagram. The opposite end of the tube is held to .314" with a tolerance of only ±.001". Bundyweld double-walled steel tubing has the necessary ductility to form this tube, *plus* amazing strength that withstands severe punishment. Can Bundy's mass-fabrication experience help *you* with tubing problems?



There's no substitute for the original

BUNDYWELD® TUBING

WORLD'S LARGEST PRODUCER OF SMALL-DIAMETER TUBING • AFFILIATED PLANTS IN AUSTRALIA, BRAZIL, ENGLAND, FRANCE, GERMANY, AND ITALY

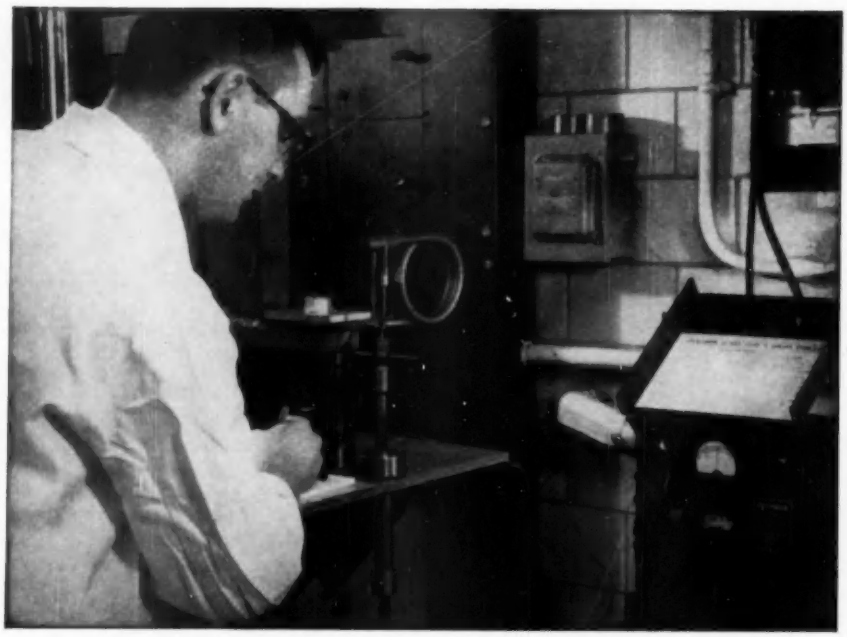
BUNDY TUBING COMPANY • DETROIT 14, MICH. • WINCHESTER, KY. • HOMETOWN, PA.

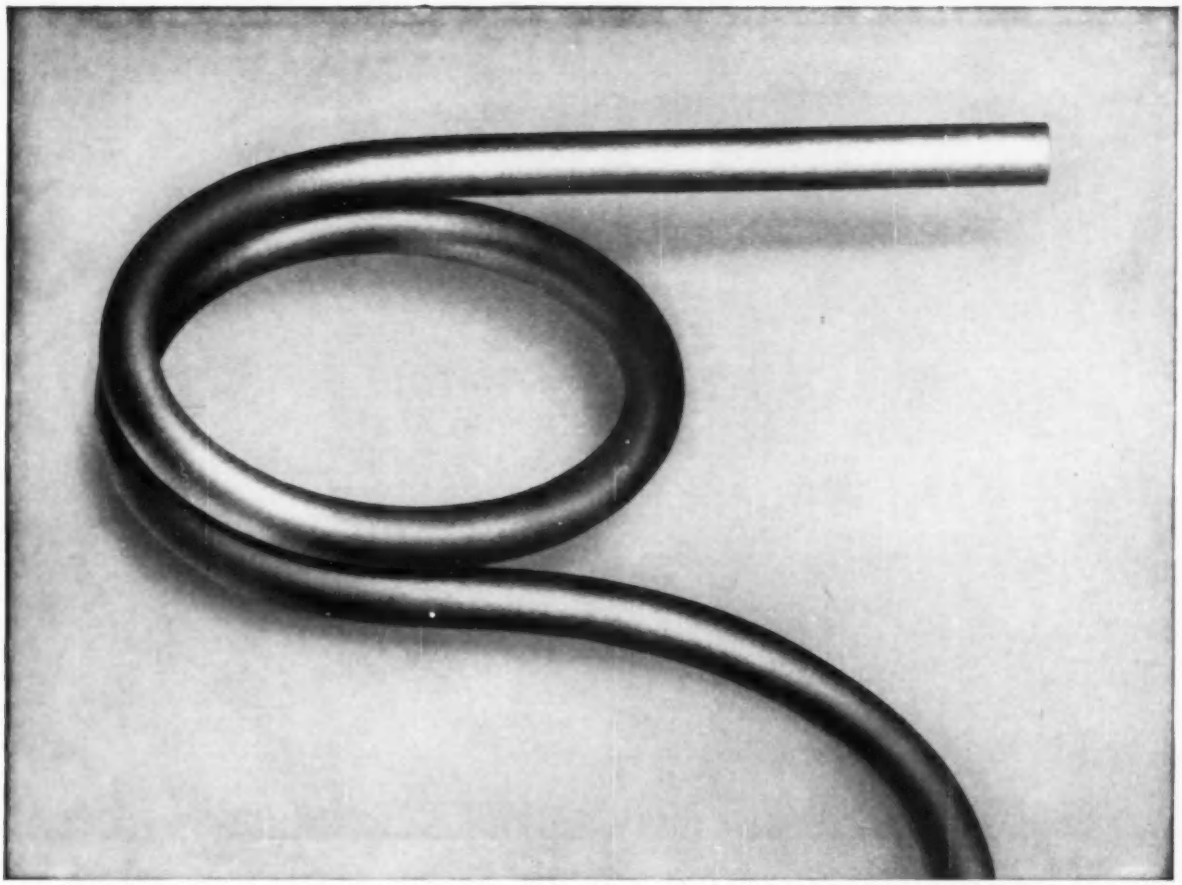
Circle 133 on Inquiry Card for more data

20,000 chairs rock on (USS) American Springs without one failure

...thanks to AS&W

In the American Steel & Wire Spring Testing Laboratory, the springs recommended for the Homecrest Chair go through extensive tests. This Fatigue machine, by means of strain-gauge verification, simulates years of use in a relatively short testing time.





Here is the spring recommended by American Steel & Wire for use in this chair. To supplement the **AS&W** tests, the Homecrest Company subjected these springs to a simulated rocking test. Under a weight of 250 pounds, these springs were rocked 750,000 times, without failure.

Spring Engineering Research Service

The Homecrest Company, Wadena, Minnesota, wanted to add a swivel rocking chair to their line of modern, functional home furniture. However, they would produce this chair only if it could be a quality item that would give good, dependable service. While designing the chair, they checked with the American Steel & Wire Spring Engineering Consulting Service. The engineers studied the problem, ran extensive tests and finally recommended a pair of round wire helical single coil torsion springs. Using these springs, Homecrest designed, fabricated and marketed the chair. Today 20,000 of these chairs have been sold and not one failure of an AS&W Spring has been reported.

Mr. A. L. Englemann, a partner of Homecrest Company, says, "We have purchased from American Steel & Wire over 45,000 springs, and not one has been reported a failure. We couldn't be happier with American Steel & Wire as a supply source for our springs."

If you have a spring problem, or would like advice on the use of springs in your product, get in touch with any American Steel & Wire Sales Office. You can benefit from the knowledge of AS&W's Spring Engineering Research Service. The Service has been engaged in laboratory experiments of static and dynamic testing for 20 years and has accumulated invaluable data on stress and fatigue life of steel springs, while endeavoring to improve efficiency in the use of steels, from steel chemistry through product application, to more economically cope with today's rigorous demands. This accumulated knowledge of the AS&W Spring Engineering Research Service is at your disposal. *American Steel & Wire, 614 Superior Ave., N.W., Cleveland 13, Ohio.*

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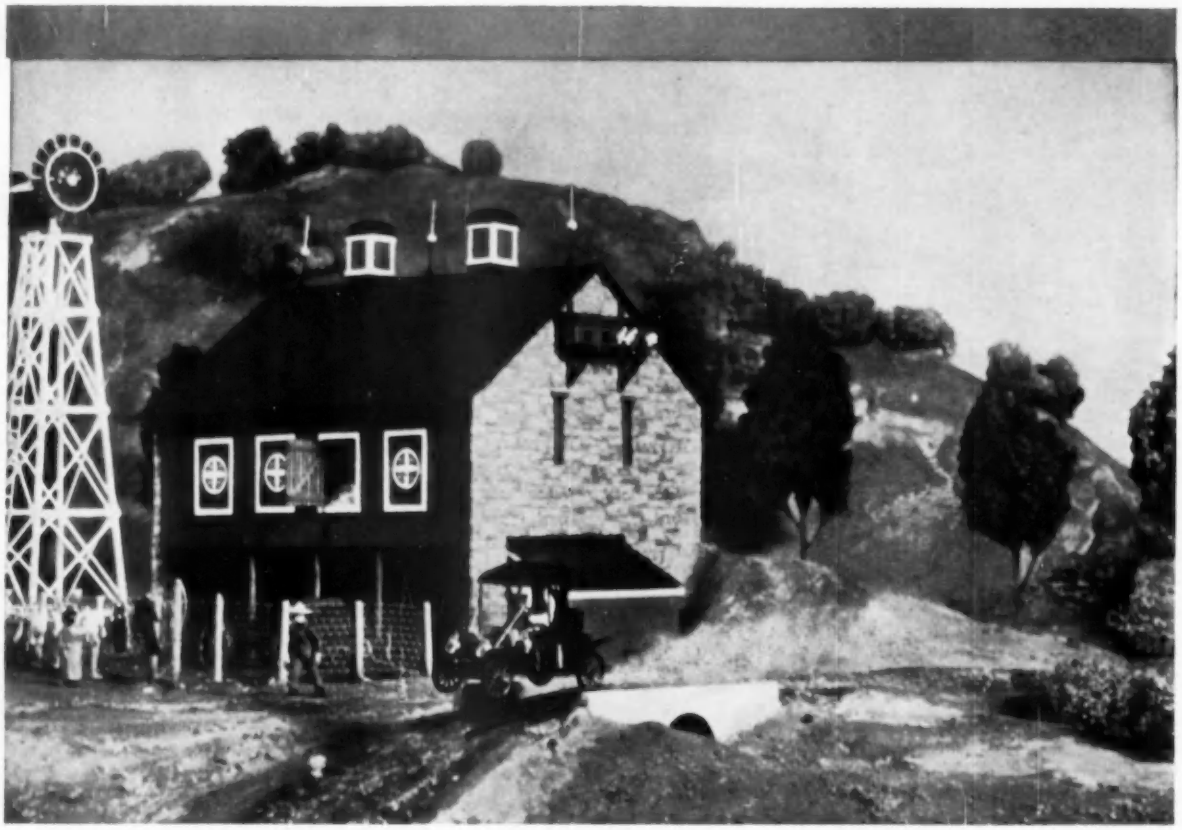
American Steel & Wire
Division of USS **United States Steel**

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • Tennessee Coal & Iron Division, Fairfield, Ala., Southern Distributors • United States Steel Export Company, Distributors Abroad



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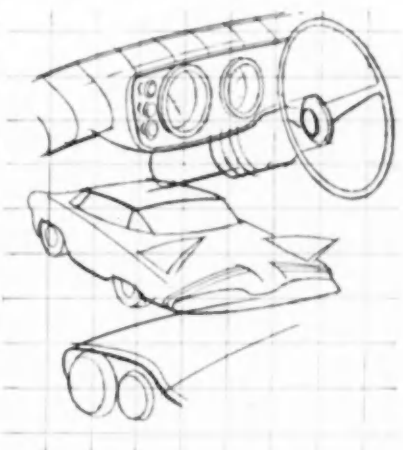
OSTUCO tubing is the exact tubing you need for your product because OSTUCO Tubing is CUSTOM MADE for your product. Your order is manufactured to your own specifications to produce steel tubing especially for your application—the precise grade, analysis, size, shape, special anneal and tolerances best suited to your own needs.

Ohio Seamless Tube produces both seamless and electric welded steel tubing—is prepared to form many finished or semi-finished tubular parts to your designs.

To get the most from your next steel tubing order, use Custom Made OSTUCO TUBING. Contact your nearest Ohio Seamless representative, or send part drawings to the plant at Shelby, Ohio—Birthplace of the Seamless Steel Tube Industry in America.



A-2168A

Model illustrated built to 3.5 mm scale.

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Division of Copperweld Steel Company • SHELBY, OHIO

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CANADA: Railway & Power Engr. Corp., Ltd. EXPORT: Copperweld Steel International Company, 225 Broadway, New York 7, New York

NEWS

FEATURES

Pleasant Predicament

Newberg Finds Sales Exceeding Production

By Hugh C. Quinn, Detroit Regional Editor and C. B. Campbell, News Editor

When William C. Newberg stepped in as president of Chrysler Corp. last month, he found himself faced with a rather pleasant predicament: Chrysler dealers were selling cars faster than the company was building them, and sales were still climbing. April sales totaled 92,929 cars, but assemblies amounted to 88,859.

So one of Mr. Newberg's first official acts as president was to approve increased production rates for May, June and July. The new schedules call for an additional 43,000 cars in May and June and an increase of 6000 for July, when current model production will begin to phase out anyway.

39 Pct Increase

"Present plans call for production of approximately 203,000 cars during May and June," Mr. Newberg said, "compared with 162,897 produced in the same months last year. This schedule will result in 610,000 cars in the first half of 1960, a good 39 per cent higher than the first half of last year."

What better way for the 49-year-old one-time test driver to start his administration as Chrysler's fourth president?

For the record, Mr. Newberg became president April 28 when L. L. Colbert, president since November, 1950, was elected chairman of the board, chief executive officer and chairman of the all-important finance committee. Mr. Newberg was given the added title of chief operating officer. He had been executive vice president since April, 1958.

The twin promotions by the 21-man board of directors capped more than two years of rumor and some two months of active speculation about top-level changes at Chrysler. They also reasserted the directors' faith in the management team that had been under heavy barrage from Sol Dann, a Detroit attorney and a dissident, but by no means small, stockholder (5100 shares).

Mr. Dann, at the shareholders' annual meeting earlier in April, had charged, among other things, nepotism, mismanagement and questionable purchasing practices. He said he could back all his charges with adequate proof.

Colbert Still No. 1

But the board chose to promote, rather than remove, Mr. Colbert and Mr. Newberg. And Mr. Colbert's promotion was anything but the "kick upstairs" so often associated with board chairmanships. In fact, as chief executive officer

(*Turn to page* 49, *please*)

DATSUN FAIRLADY MAKES BOW

A four-passenger personal car with a top speed of 82 mph, the Fairlady is being introduced in the U. S. and Canada. An all-steel body replaces fiberglass earlier models. It has four-cylinder OHV engine, and torsion bar suspension.

AI TABLOID

Publication of an Industrial Reports Register developed by the Air Materiel Command and the aerospace industry will sharply reduce reporting costs and time in weapons manufacture. Air Force officers have estimated the register will reduce the number of hours spent in reporting about 25 per cent.

* * *

Turnpike driving should feel smoother on highways that have been opened for some time. Experiments showed that when the Ohio Turnpike was three months old it took only 10,000 miles to wear the tread smooth on a tire. Twenty-seven months later an identical test tire went 33,000 miles before its tread was smooth. In the interim, the turnpike surface had been worn smoother.

* * *

A two-part report of Air Force-sponsored research into magnetic amplifiers circuits has been published for sale to industry through the Office of Technical Services, Business and Defense Services Administration, Dept. of Commerce.

* * *

Manufacturers in the metalworking machinery industry shipped products valued at $860 million in 1958, a 2 per cent decrease from 1954. Average industry employment showed a 13 per cent decrease during the same period. Value added by manufacture amounted to $470 million in 1958, a decrease of 7 per cent from 1954.

* * *

Nickel consumption in North America in 1959 has been estimated at well over 200 million lb, as compared with 160 million lb in the previous year.

* * *

Centralization of supervision and co-ordination of test ranges, tracking stations and other technical facilities used in the missile and space programs will be within the office of the Director of Defense Research and Engineering.

Twenty-three studies for the Atomic Energy Commission in the fields of metallurgy and ceramics have been released for sale to the public.

* * *

Seventy-five per cent of the rubber used in modern automobile tires is synthetic, one of the factors contributing to longer life and smoother performance of today's tires. Engineers say the percentage of synthetic rubber in tires may increase with development of new synthetics, such as polyisoprene Natsyn.

* * *

Manufacturers in the steel spring industry shipped products valued at $106 million in 1958, a 14 per cent decrease from 1954. Average employment dropped even more, a 22 per cent decrease.

* * *

A special advisory committee of the National Academy of Sciences has recommended establishment of an Office of Assistant Secretary of Commerce for Science and Technology. The committee urged appointment of an official "with professional and management experience in science and technology."

* * *

Thinking of converting to throw-away tools? The estimated savings as well as the technical problems of converting from the use of single-piece, brazed carbide cutting tools to throw-away type tools are discussed in an Air Force report issued recently.

* * *

Commercial buildings' windows made of nickel stainless steel are now available with color coatings that are permanent and are not affected by the weather.

* * *

Pleasure boat gasoline consumption totaled 490 million gal in 1959, up 21 per cent from 1958. Outboards accounted for 336 million gal. Several oil companies are seeking pumps that will mix oil and gasoline. The major problem is foaming when oil and gasoline are mixed too quickly.

AMA's Yearbook Lists Vital Figures

A record 70.4 million motor vehicles traveled nearly 700 billion miles last year in the U. S. to set an all-time record.

In many other ways it was a big and busy automotive year in which motor transportation played a greater-than-ever role in the life of the American people.

This is the story told by the 1960 edition of Automobile Facts and Figures, statistical yearbook published by the Automobile Manufacturers Association.

The book reveals motor vehicle factory sales of 6,728,644 in 1959. This included 5,591,243 passenger cars, 1,137,401 truck and motor coaches. These products had a wholesale value of $12.8 billion. Replacement parts sales totaled $2.2 billion.

Training Centers Busy 10.5 Million Hours

Since the first General Motors Training Center opened in 1953, more than 10.5 million hours of specialized training and instruction have been given to dealer automobile mechanics and other personnel through the GM Service Section. GM now has 30 training centers.

The majority of the trainees are studying automobile and truck service techniques, but the centers also give instructions in non-automotive products such as marine engines, refrigerators, and off-the-highway diesel equipment. Myrle St. Aubin, director of the Service Section, said auto repair registrations totaled 115,341 during 1959, with a total of 1,875,000 class hours.

(*Continued from page 47*)

and chairman of the finance committee, Mr. Colbert will be playing a very active role in Chrysler's business.

Mr. Colbert, a 27-year Chrysler veteran, still is No. 1—as indicated by Mr. Newberg's reference to him as "the Boss."

As chief operating officer, Mr. Newberg handles the day-to-day decisions and business of the giant firm.

Since 1956, the year that K. T. Keller retired as board chairman, Chrysler has been undergoing internal reorganization. In July, 1956, Mr. Colbert called on Mr. Newberg and E. C. Row to handle the planning and administration of the program. Mr. Colbert says Chrysler now is at the "zenith" of the rebuilding program that was started then.

The company's unit sales of 363,807 cars in the first quarter represented 15.4 per cent of all domestic sales, a definite improvement for Chrysler. A year ago the company had only 11 per cent penetration in the first quarter, and only 13 per cent for the entire year.

16 Pct. Penetration

During March and April, with the new Valiant and Dart leading the way, Chrysler increased its penetration to 16.1 per cent.

Chrysler also improved its working capital and cash positions during the first three months of 1960. Working capital increased from $275 million at the end of 1959 to $321 million, with cash and short-term marketable securities increasing from $194 million to $257 million.

Currently, 80 per cent of Chrysler's production is in the Valiant, Plymouth and Dart lines. In the fall, the company will add the compact Lancer to this group, so that Chrysler's position in 1961 could be even stronger. Tooling costs for 1961 will not be nearly as heavy as the $163.8 million Mr. Colbert said were spent to bring out the unit-body '60 models, so Chrysler's profit picture should be much more attractive.

FRENCH TWO-SEATER SPORTSTER

France Jet claims safety, economy and roadability elements. Ready for distribution in July, it has fiberglass body reinforced with aluminum. It has one-cylinder aluminum rear engine of 19 hp. It can do 70 mph.

Willys Argentina Plant Has Record Output

Industrias Kaiser Argentina produced a record 8683 vehicles in its Cordoba, Argentina, plant in the first quarter of 1960. Gross sales for the period exceeded $24 million.

IKA, an affiliate of Willys Motors, Inc., manufactures six "Jeep" vehicles and the Kaiser Carabela and Bergantin passenger autos. Production of the Renault Dauphine is scheduled to begin in June in the Cordoba plant.

Gets Institute Post

Capt. Paul J. Burr, UNS (Ret.) has been named technical services director, Institute of the Aeronautical Sciences, New York.

April Comet Sales Topped Production

Early sales figures indicate that Ford Motor Co.'s new Comet is, in reality, a rising star. Sales of the compact during April actually outstripped production, and the trend since introduction last March 17 definitely has been upward.

In April, retail sales totaled 17,996 units, making a total of 28,386 Comets sold so far. Production last month totaled only 17,170 cars, down from a scheduled 20,000 due to a strike-caused shortage of steering units.

Have salesmen been neglecting Mercury in a rush to get on the compact bandwagon? Apparently not, as Mercury sales figures indicate.

True enough, Comet outsold Mercury during Comet's first month and a half. But Mercury sales have continued to increase, with deliveries in April climbing to 14,646. This was four per cent above March and five per cent ahead of April, 1959

TOYOPET TIARA ARRIVES

Four-door Japanese model which made its bow at the International Auto Show. It is powered by four-cylinder 75 hp OHV engine.

Willys, T R W Form Argentine Company

Willys Motors and Thompson Ramo Wooldridge have formed a new company to manufacture valves and other automotive parts in the Argentine. The new firm, Productos Thompson Argentina, is owned jointly by Thompson Ramo Wooldridge and Industrias Kaiser Argentina, an affiliate of Willys.

PTA will build a new plant at Santa Isabel, near Cordoba, where Industrias Kaiser is located. Full capacity will be reached within eight months of initial production, and employment eventually will total 200.

Officials of the two firms expect that domestic production of valves for automobile, truck, tractor and industrial engines, as well as other spare parts, will effect a savings of $1 million a year for Argentina.

Chrysler Associates Fete Retiring Zeder

More than 300 associates at Chrysler Corp. and educators attended a party for James C. Zeder who has retired as vice president and special adviser to the president of Chrysler.

Mr. Zeder, 60, was a founder of the Chrysler Institute of Engineering in 1931 and served as its president since 1947. He expects to devote himself to engineering developments at Michigan State University.

Among automotive "firsts" credited to Mr. Zeder are hydraulic brakes, all-steel bodies, and full-time power steering.

L. L. Colbert, Chrysler board chairman, praised Mr. Zeder as a "truly professional engineer" and listed his many contributions to development of the automobile.

Boat Loans Second To Auto Financing

The dollar volume of loans made to consumers for the purchase of recreational boats in 1959 ranked second only to the financing of automobiles, a nation-wide survey has revealed.

The survey shows the boat loan dollar volume exceeded the amounts loaned for purchases of house furnishings or home appliances. All banks in the survey make boat loans. Ten years ago, only 20 per cent of banks offered this service.

Analysis of the loans last year showed the average automobile loan to be $1677, while the average boat loan amounted to $1277. Average loans for furnishings and appliances were $464 and $274.

Zinc Institute Moves

American Zinc Institute, Inc., is occupying new and larger offices at 292 Madison Ave., New York 17, N. Y.

Diversifying S-P Buys Gravely Tractors

Studebaker-Packard Corp. has taken another step in its long-range diversification program with the purchase of Gravely Tractors, Inc., of Dunbar, W. Va. The 38-year-old utility tractor manufacturer had earnings of $2.1 million, before taxes, in 1959.

Gravely has plants in Dunbar and in Albany, Ga., Fort Scott, Kan., and Torquay, England. The company also has 47 subsidiary distribution centers throughout the U. S. Basic product is a 6.6 hp gasoline-powered utility tractor. Gravely attachments include equipment for mowing, snow removal, plowing, cultivating, sweeping and spraying.

D. Ray Hall, president of Gravely since 1936 and principal owner, will continue as president and general manager of the Gravely Tractor Div.

The acquisition is Studebaker's third under its young expansion program. President Harold E. Churchill commented that the Gravely Div. will boost the corporation's subsidiary earnings to $6 million a year, counting $2 million from Mercedes-Benz Sales, and $1 million each from Gering Plastics and CTL Div..

Imports Continue To Outstrip Exports

Imports of foreign autos continued to outstrip export of American models during the first two months of 1960.

In January and February 111,901 autos valued at $123,807,436 came into the U. S. while U. S. makers exported only 24,490 autos worth $50,098,438. Imports of 3020 trucks and buses were valued at $3,846,831 while 27,268 trucks and buses exported were valued at $55,404,432.

First-Quarter Sales Set Several Records

Here is a capsule roundup of January-March operations of the five major automobile manufacturers:

AMERICAN MOTORS: Record dollar sales and record earnings based on record unit sales in the January-March period. Sales totaled $293.3 million, up 28 per cent from a year ago. Earnings of $14.4 million topped the year-ago figure by nearly $2 million.

Profit margin was held down, reports president George Romney, by heavy payments for premium steel ($7 million in six-month period), and by three-shift, heavy overtime, production rate. April sales of 47,256 set new all-time mark, topping June, 1959, by 3700 units.

CHRYSLER CORP: Sales rose in first three months (from $691 million in 1959 to $926 million), but earnings dropped (from $15.2 million to $10.2 million). Car and truck sales up from 233,185 a year ago to 363,807. Chrysler, like American Motors, blames part of the profit-pinching on premium steel, which cost Chrysler about $26.5 million in January-March period. Another reason cited is shift in sales volume to lower-priced, less elaborately equipped passenger cars such as Valiant, Dart. April sales of 92,929 passenger cars best since August, 1957 and 32 per cent higher than April, 1959.

FORD MOTOR CO.: Net income of $143.1 million on sales of $1.57 billion, compared with year-ago earnings of $134.8 million on sales of $1.45 billion. Hot-selling Falcon racked up sales of nearly 170,000 in first four months.

GENERAL MOTORS: Sales hit all-time high of $3658 million in period, up from last year's $3206 million. Earnings, at $1.14 a share, totaled $324 million, highest of any first quarter, and $31 million above '59. Production through April nearly 200,000 up on last year. Cadillac, Chevrolet report record sales in first four months.

STUDEBAKER-PACKARD: Still above water, although profits dipped to $2.8 million, down from 1959's $7.8 million. Sales dropped from $115.5 million last year to $91 million.

RENAULT'S PETIT-PANEL TRUCK

New light truck made U. S. debut at fourth annual International Automobile Show in New York. It is powered by 32 hp, four-cylinder engine through a four-speed, fully synchronized transmission and transaxle.

Ford Urges Workers To Support Politics

Employes of Ford Motor Co. are getting a chance to take an active "grass roots" role in politics. Ford contacted all of its employes—more than 152,000—urging them to contribute financially to the political party of their choice.

The financial aid plan is an extension of Ford's Effective Citizenship Program, which also urges employes to participate in their party's activities and organization. The contribution plan, as Ford describes it, will be confidential. Collections, in sealed, unmarked envelopes, began at Ford plants and offices May 9.

Chevrolet Builds Land For Plant Expansion

What does a manufacturer do when there is a shortage of available land for further plant expansion? One solution: build more land, which is what Chevrolet is doing at North Tarrytown, N. Y.

The Chevrolet assembly plant and adjacent Fisher Body plant are located on the Hudson River, and a fill project soon to get under way will provide 14 acres of new land for construction of additional facilities for both Chevrolet and Fisher. J. Rich Steers, New York marine contractor, will build a retaining dike some 2400 ft long and 100 ft wide, which will be filled with about a half-million cu yd of sand.

Plant expansion plans are still under development.

SAE Summer Meeting Slated for Chicago

The Society of Automotive Engineers' summer meeting will be held June 5-10 at the Edgewater Beach Hotel, Chicago. In previous years, summer parleys were held in Atlantic City.

Record attendance is expected with shifting of the meeting to Chicago. Technical material to be presented has been greatly expanded. Sixty-six technical papers will be presented at 34 technical sessions.

ALEMITE BARREL-TO-BEARING LUBRICATION...

prime mover in production!

Plant men who recognize lubrication as an important production tool – not just a maintenance problem – are collecting new dividends in increased production.

They use modern Alemite Barrel-to-Bearing Lubrication . . . years ahead methods that add efficiency and speed up production in all sizes and types of plant operations . . . assure better, lower-cost protection . . . cut downtime, prolong machinery life.

Alemite lubrication equipment includes electric, air or hand-operated equipment . . . everything required for high-pressure lubrication, filling of hydraulic systems, servicing oil reservoirs, lubricating gear housings, and refilling grease guns.

Let an Alemite expert help you with the most efficient lubrication system ever developed. A letter or phone call will bring him to you, at no cost or obligation.

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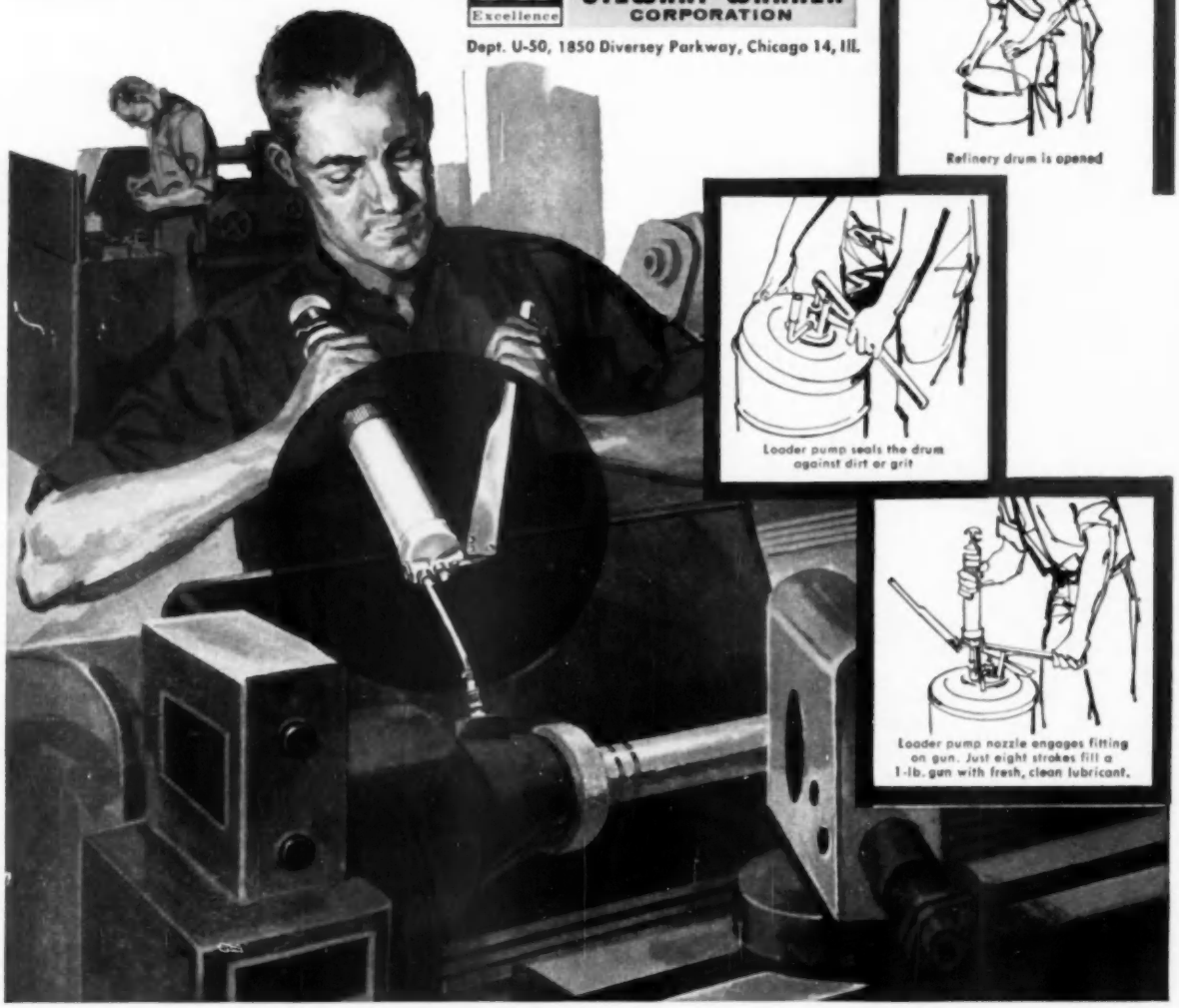

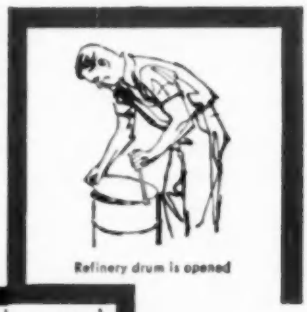

Refinery drum is opened

Loader pump seals the drum against dirt or grit

Loader pump nozzle engages fitting on gun. Just eight strokes fill a 1-lb. gun with fresh, clean lubricant.

Circle 135 on Inquiry Card for more data

MEN IN THE NEWS

Chrysler Corp., Plymouth - De Soto - Valiant Div. — Ronald B. Christiansen has been named field fleet service manager.

A. O. Smith Corp., Automotive Div.—J. S. Ross has been named manager of production and material control.

Ward LaFrance Truck Co.—Eugene B. Findley has been appointed director of operations.

Fruehauf Trailer Co. —Robert Vujovich has been named director of quality control.

Pratt & Whitney Co. —Edward E. Kirkham has been appointed chief engineer of machinery engineering dept.

Fuller Mfg. Co., Unit Drop Forge Div. —Frank M. Weinhold, Jr. (left) has been promoted to general manager and George J. Houting has been named assistant general manager.

Electric Autolite Co.—**Karl Chalmers, John W. Lingle** and **Robert Price** have been named product merchandising managers of the Service Parts, Spark Plug and Battery Divs.

Ford Motor Co., Ford Div.—**Clem R. Kirk** has been appointed engineering administration manager.

Globe-Union, Inc., Battery Div.—**J. V. Tierney, Jr.,** has been appointed manager, quality assurance.

Hyster Co.—**James L. Woodley** has been promoted to head all manufacturing activities.

International Nickel Co., Primary Nickel Dept.—**Kenneth A. DeLonge** has been named manager of direct sales.

Firestone Tire & Rubber Co.—**A. P. Favalon** has been named assistant manager of company stores.

Bendix Aviation Corp., Scintilla Div.—**Donald S. Jones** was promoted to executive assistant to the general manager and **Thomas B. Kreutz** was named director of industrial relations.

Martin Co.—**Douglas V. Dorman** has been named corporate vice president of industrial relations.

Firth Sterling Inc., Steel Div.—**Robert K. Warren** has been named vice president of sales.

Ford Motor Co., Ford Div.—**Richard A. Godfrey** has been appointed divisional car marketing manager; **Charles V. Toussaint** has been named manager, Kansas City district sales office, and **Walter S. Walla** has been appointed manager, business management department.

Vickers Inc., Aero Hydraulics Div. —**T. N. Duncan** has been appointed manufacturing manager.

General Motors Corp., Chevrolet Motor Div.—**E. L. Harrig,** manager of national service and mechanical dept., and **Robert S. Plexico,** chief truck design engineer, have retired.

ACF Industries—**Harvey C. Hopkins** has been appointed vice president-purchasing.

Walker Mfg. Co.—**James H. Bennett** has been appointed original equipment sales manager and **Donald C. Miller** has been named Ohio territory manager.

General Motors Corp., Chevrolet Motor Div.—**L. W. Johnson** has retired. He was administrative assistant for parts distribution.

Arvin Industries, Inc.—**George R. Perkins** has been named north-central zone sales manager.

General Motors Corp., AC Spark Plug Div.—**William G. Davis** has been named reliability engineer for transformer manufacturing.

Electric Autolite Co.—**C. A. Deguez** has been named director of aerospace sales.

Dana Corp., Universal Joint Div.—**John P. Henson** has been named sales manager.

American Motors Corp.—**John W. Raisbeck** has been named assistant to the president. He will be responsible for financial planning.

Otis Elevator Co., Baker Industrial Truck Div.—**S. M. Humphreys** has been appointed assistant general manager.

North American Aviation, Inc.—**Maurice R. Van Camp** has been appointed comptroller and assistant treasurer.

Hughes Tool Co., Aircraft Div.—**Robert A. Wagner** has been appointed manager.

General Motors Corp., Ternstedt Div.—**Frank O. Riley** has been named general manager.

Necrology

Harold D. Tompkins, 66, a vice president of Firestone Tire & Rubber Co., died April 17 while visiting relatives in Boston. He lived in Hudson, O.

Robert A. Burgoyne, 47, vice president of Dunlop Tire & Rubber Corp., died April 15 in Wigan, England. He was head of Dunlop's manufacturing, production and technical divisions in Buffalo, N. Y.

Raymond G. Largent, 57, secretary and comptroller of Cessna Aircraft Co., died April 14 in Wichita, Kan.

William M. Buttriss, 52, director of advertising and sales promotion for Tinnerman Products, Inc., died April 4 in Cleveland.

Advertisement

R B&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By Fred E. Graves

No difference between hex and cap screws

It's not the *name* of a standard fastener that determines whether to use it for a particular application, but vice versa. The *application* requirements for strength and tolerances dictate the fastener.

Thus, if you have a joint that calls for certain tolerances in a screw, obviously the one which satisfies those tolerances is the right fastener.

IDENTICAL STANDARDS

In the case of cap screws and hex screws, the standards will show you that these are merely different names for the same product. They're actually made on the same machines, to identical tolerances, and from identical materials.

No reason then to differentiate. For tapped holes, merely specify Hex Screws (SAE Grade 2) or High Strength Hex Screws (SAE Grade 5), and you'll get the *right* fastener with the quality needed.

For bolted joints, these same items are supplied with nuts when specified.

This should suggest a way you can extend standardization in your plant . . . and benefit from our new simplification of nomenclature which calls *any* fastener with head on one end and threads on the other a *screw;* and a screw plus nut a *bolt.*

See how "holding power" can cut fastener costs

SIZE	SAE GRADE	SAE PROOF LOAD	COST RATIO
¾"	Gr. 5	28,400 lbs.	100%
1"	Gr. 2	16,950 lbs.	188%
1⅛"	Gr. 2	21,350 lbs.	239%
1¼"	Gr. 2	27,100 lbs.	277%

Since the usual job of a threaded fastener is to hold an assembly tightly together, its *clamping force* is what you're really utilizing. This seems obvious. But how best to get the clamping force needed for the joint design? Not so obvious. Looking at size alone can be misleading . . . *and quite costly,* as the chart above demonstrates.

HOLDING POWER MEANS MORE THAN SIZE

SAE "proof load" of four different hex screws of standard steels, along with typical cost ratios, are compared. Almost unbelievable, isn't it? Yet it's a fact that the smallest of the group—the heat treated SAE Grade 5 *RB&W High Strength Hex Screw* exceeds all the others in load capacity. It can be used in place of any of the others in most normal usages.

Since it's smallest and therefore weighs the least, it also costs less... 64% less than the 1¼-inch grade 2 hex screw; 58% less than the 1⅛-inch; 46% less than the 1-inch. And since holes can be made smaller, there are also the savings in production drilling . . . and possibly in materials, too.

DESIGN ADVANTAGE

Remember, too, that smaller fasteners are more easily torqued to higher preload levels . . . which helps keep joints tight, makes them more vibration-proof.

If you would like to explore this approach to fastener economy and better utilization of "holding power," consult with an RB&W specialist. Let him contribute his fastener knowledge to your design and production needs. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa., Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

an Editorial

"MMT=PE"...

Code Name for 1961 Profits

VISITORS AT PLANTS IN THE automotive industries these days often display a small red and gold lapel button on which is inscribed the letters MMT = PE. This is the coded insignia displayed to promote interest in The Machine Exposition—1960. In a larger sense, this code could well be described as a key to increased 1961 production profits.

THE MACHINE TOOL EXPOSITION—1960 comes at a most appropriate time. The automotive industries of the United States have gone through a cycle of production equipment planning since 1954 which has created a need for a further review and re-development of plans for production equipment buying. As described by many plant managers, during personal interviews, there was a considerable under-estimate of the total high production equipment requirements for some of the compact cars. Even the most optimistic estimates of projected sales did not envisage the total emergence of compact car demand which has appeared. As predicted in these pages, second quarter schedules are being raised.

WHILE IT IS AN ADDED CHORE for planning analysts, this is the time when it is proper to look ahead on current Master Schedules. Time taken now to include some factors of substantial advances in machine tool developments will be time well spent. While many of these advances may not be fully disclosed in advance of The Machine Tool Exposition, September 6-16 at Chicago, probably every machine tool builder would welcome the opportunity to discuss requirements which could be anticipated.

DURING RECENT PLANT TOURS, almost every plant manager has pointed out to me some existing production equipment which is doing less than the best that could be expected in production efficiency. The consensus is that production efficiency is still a major goal of improvement. Achievement of higher goals is essential if continued improvement in profits is to be obtained by the industry. The records of earnings throughout the industry for the first quarter of 1960 show very definitely that it is a financially appropriate time to start a new cycle of major modernization of production tools where improvements are greatly needed. The tight controls over expenditures for new production equipment which existed during 1958 and part of 1959 are under continuous review in many plants and may be replaced with a policy of systematically improving facilities which will pay off in profits.

THE PRELIMINARY STUDIES WHICH are later converted into actual programs for buying equipment are a vital part of the dynamic functions of the automotive industry. For the most part, such studies are much more advanced than the studies which are made in other industries. The effect of this continuing operation is of great importance and value to corporation management in the automotive industries. As was pointed out by Carl F. Stugard, Vice-President of The Cincinnati Milling Machine Co., at the 28th annual meeting of ASTME recently in Detroit, since 1930 any company taking full advantage of new developments in machine tools has been able to double its metal cutting productivity every ten years. This trend shows no signs of slowing down. The next ten years of advances in automotive plants will be substantially aided by the programs which evolve out of automotive planning for and participation in events identified by the symbol "MMT = PE." (Modern Machine Tools give Production Efficiency.) ■

Hartley W Barclay

Editor and Publisher

GREATER RUN-IN PROTECTION EXTENDS PISTON LIFE OF CURTISS-WRIGHT ENGINES

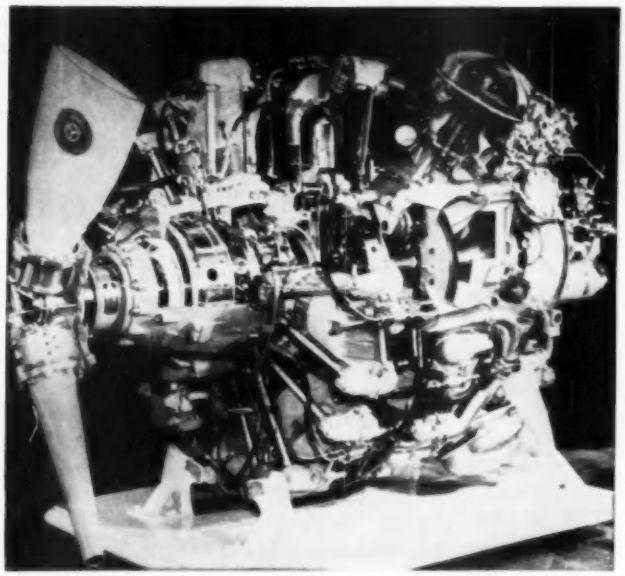

Photo courtesy of Curtiss-Wright Corp.

Curtiss-Wright Corporation's Wright Aeronautical Division, located at Wood-Ridge, N.J., has extended the "life span" of pistons used in their radial reciprocating airplane engines. By coating piston skirts with 'dag' 213 — a dispersion of graphite in an epoxy-resin binder — they are protected against scuffing, scoring, galling, and seizing during the critical running-in period.

Where previously Curtiss-Wright engineers had used finely powdered graphite and phenolic resin, they found that 'dag' 213 was more uniform in consistency and had better adhesion . . . was actually adsorbed by the surface to form a more durable, corrosion-resistant film that became virtually integral with the metal. Due to the heat-transmission properties of 'dag' 213, the coefficient of friction is kept at a uniform minimum to assure free action and proper wear-in characteristics. The exacting clearances in reciprocating engine design make the run-in process so critical that perfect friction and heat control must be maintained under the speeds and loads required. In addition, the graphoid surface takes over the job of supporting the load if the liquid lubricant ruptures momentarily during run-in, thereby preventing metal-to-metal contact until the oil film re-establishes itself.

'dag' 213 is spray-applied at Curtiss-Wright with conventional spray equipment. After the piston skirts are coated, the preassembled pistons are oven-heated at 350°F for 2½ to 3 hours. Fabrication and treatment techniques used at Curtiss-Wright permit a high degree of accuracy in maintaining piston and cylinder wall tolerances. Only forged aluminum alloys are used for these pistons which operate within nitrided steel cylinder walls. The application of Acheson's 'dag' 213 has been extended to all models of Curtiss-Wright engines in both their 18 and 9-cylinder categories. Investigate the use of an Acheson Dispersion in your own assembly or run-in application. Write Write Dept. AI-50.

New Literature Describes Assembly and Run-in Uses

The value of Acheson Dispersions as additives in assembly and run-in lubricants is described in easy-to-read form in a recently printed brochure, Bulletin 421. A copy for your personal file is available immediately upon request.

It covers the many advantages Acheson customers are gaining in these critical applications by using colloidal dispersions which:

1. Provide smoother bearing surfaces through control of the wear rate.
2. Permit closer tolerances due to their microscopic, flat particle size.
3. Allow increased power because of reduced friction.
4. Lower bearing temperatures.
5. Increase the affinity of mating metal surfaces for oil.
6. Lessen oil consumption.
7. Shorten the period necessary for run-in.
8. Protect against momentary oil failure.
9. Lower maintenance and replacement costs.
10. Insure a longer, more trouble-free equipment operating life.

If you are concerned with the design or manufacture of engines, motors, bearing assembly, or machinery, Bulletin 421 should prove of interest to you. The vital contribution which Acheson Dispersions of colloidal graphite or molybdenum disulfide make in safeguarding against excessive wear during running-in, is a matter of record. Also, Acheson dry film lubricants, used in assembly press fit applications, are providing effective lubrication without sacrificing the tolerances involved. Send for your copy of Bulletin 421, "For Assembly and Run-in Lubrication".

'dag' is a trademark registered in the U.S. Patent Office by Acheson Industries, Inc.

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Old Reliable Cars Feature Refinements for Indianapolis "500"

By R. Raymond Kay
PACIFIC COAST EDITOR

1959 winning car—the Leader Card Special—ready to go again this year. The Watson-designed car is shown on its custom-built trailer also designed and built by Watson. The trailer has a special safety feature in a master cylinder mounted between the dual front wheels. This automatically puts on the trailer brakes if the trailer hitch comes uncoupled from the towing car.

YOU'LL be hearing the big roar from the Indianapolis Speedway soon.

The fast boys are all tuned up for the 44th annual 500-mile speed classic on Memorial Day. And they're set to put the bricks on fire.

Some 60 cars will battle it out for one of the 33 starting positions. It will take a scorching 143 mph average speed to qualify.

Barring accidents, and with favorable weather and track conditions, speed for the race should average 136 to 137 mph. And there's a good chance of a new one-lap record of 150 mph.

Racing enthusiasts all over the world are waiting for the event. They know that the 500-miler is sure to deliver the thrills.

Roger Ward won last year's event with a record-breaking average speed of 135.857 mph. He took home $106,850 of the total $338,100 in prize money. This year's prize will be even bigger.

There are few radical engineering changes in the current entries. In fact, nothing really new has showed up at the Speedway in quite a while. Almost every car in the race has similar chassis and suspension. And almost all have mounted the good old workhorse, the 4-cyl Meyer & Drake 255-cu-in.-Offenhauser engine.

Every once in a while you run across an automotive writer or race expert who claims that Indianapolis racing hasn't done anything for the automobile industry or the motorist. (*continued*)

What's New for 1961?

It's do or die for the Novis. Lady Luck must smile on them this year—or they'll be retired from Indianapolis competition.

This year's race is the Novis' 15th try at the Speedway. When racing experts get together, they pretty much agree that these are the fastest and most powerful race cars today. But they don't win.

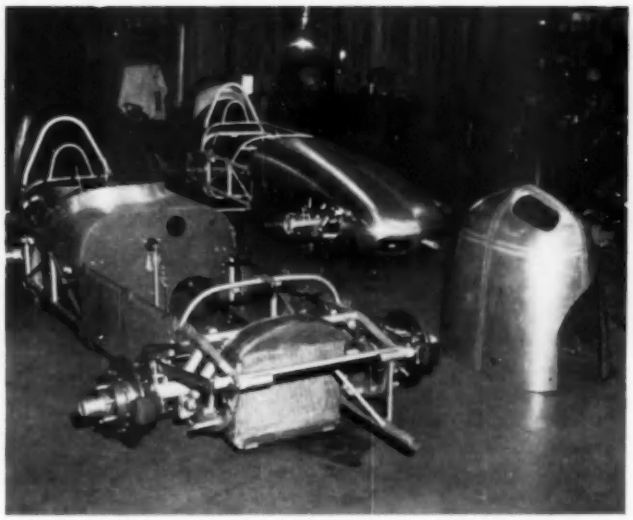
In an exclusive interview with AUTOMOTIVE INDUSTRIES, Lew Welch, owner of the Novis, said, "It's the last chance for my cars. If they don't win, I'll withdraw them from racing."

However, Mr. Welch has a big surprise in store for racing fans. He's grooming a new lightweight engine that would meet Speedway rules. It's a 6-cyl Diesel of the two-stroke type. And it has no valves. Weight will be equal to a gasoline engine.

Mr. Welch is eyeing the marine and industrial fields as the first market for this new engine. But he says a few minor modifications would easily qualify it for Indianapolis racing.

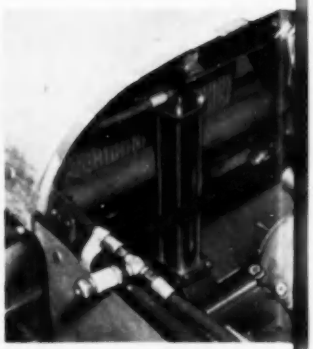
So, whether or not a Novi makes it this year, you can look for a new Welch entry in 1961—with his lightweight Diesel. . . .

There's talk in the racing fraternity that another major tire company will bring out a new Indianapolis tire in time for 1961 competition.



The A. J. Watson shop in Glendale, Calif., with two of his six 1960 series cars. Car in foreground shows single unit Halibrand spot disk brakes, narrow radiator, double front shocks, magnesium fire wall, and dual roll bars.

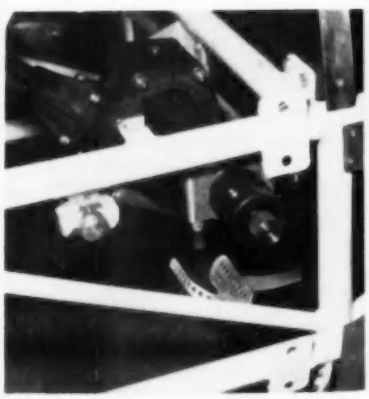
Shown here is right front axle of Watson 1960 series car. Just above axle is a major change in this year's design. It's a spindle arm support on top of the axle. Drag link is below the spindle. This change of location affords more positive steering action.



Watson's 1960 series uses three air jacks for high-speed tire changing during pit stops. One unit is mounted forward, immediately behind the center of the front axle. Other two are just in front of the rear axle inboard of the frame rails on either side.

All three jacks are the same: 2½ in. diam, 14 in. long, aluminum body units, operating at 300 psi. They can raise the car off the ground in 0.3 sec—lower it in 0.7 sec. This cuts something like 10 to 15 sec off a pit stop. Photo shows air hose connection point in the lower center.

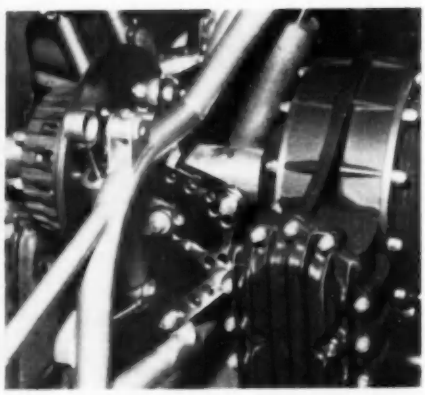
WATSON SHOP, AND CAR DETAILS



Accelerator foot loop is mandatory on all cars in this year's race. Purpose is a safety feature. It gives the driver a chance to work the pedal should the pedal springs fail.

Photo shows the larger horizontal frame rails, 1½-in. 0.049 in. 4130 chromemoly tubing, with smaller ⅞ in. support rail of a Watson car.

Steering control unit in center of photo, mounted to instrument panel and the frame, is latest Halibrand unit.



Closeup of A. J. Watson car showing Halibrand rear end with quick-change center section. To left of center of photo is Jacob's ladder. This arrangement prevents transverse motion of the axle in relation to the frame. Tubular chassis construction is 4130 chromemoly; 1½-in. 0.095, with supports of ⅞-in. 0.095.

HALIBRAND STEERING, AND REAR END, ON WATSON CARS

In answer to those critics, it's a well-known fact that many improvements in today's cars can be traced to the Speedway. High compression engines, fuel injection, and high speed tires—all were tested and proved at the track.

New and fresh competition is sorely needed to challenge the Kurtis and Watson built cars and the Offie engines. About half of this year entries are Kurtis built. Why? The big money drivers want only proved cars. They won't gamble on anything new.

AUTOMOTIVE INDUSTRIES interviewed Frank Kurtis, dean of American race car designers. He believes that under present racing rules, there's no incentive to come to the track with something novel.

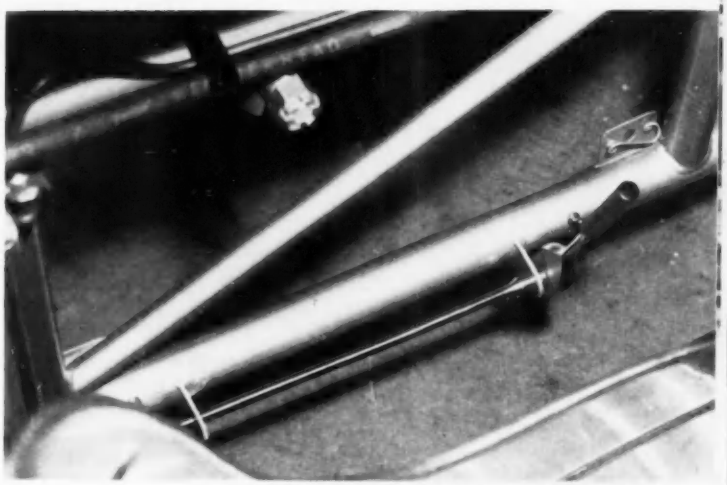
Mr. Kurtis is pumping for a rule change to permit smaller engines. These would give race car builders a need to design something brand new.

Can smaller engines reach present day speeds? Mr. Kurtis says, "Yes, within a few years of introduction. But the big thing is that the drivers would have a greater

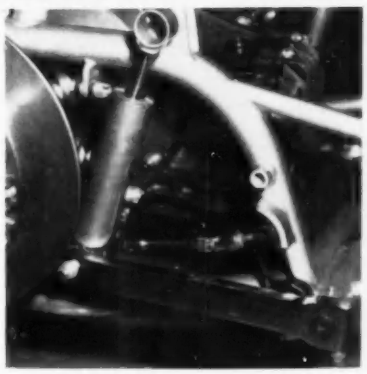
Driver's left hand operates handle of ratchet-wrench that controls weight-shifting device in A. J. Watson-built Agajanian Special. Device consists of standard ratchet-wrench, U-joints, and ⅝ in. sockets.

These are coupled to an adjusting screw on the left rear torsion bar. With driver adjustment, weight can be shifted on to right rear wheel to compensate for diminishing weight from fuel usage. Average 55-gal fuel weight will come to about 350 lb. The ratchet device tends to equalize the continuously diminishing weight carried on the rear wheels.

Photo (right) shows ratchet-wrench and drive in cockpit's lower left. Photo below shows drive, the U-joint and the adjusting screw just behind the left rear shock and the lower frame rail.



WATSON-BUILT AGAJANIAN SPECIAL



margin of safety. Both the engine and the car could be engineered from scratch with the safety factor very much in mind.

"To get higher speeds out of today's Indy engines, the driver has to really extend both himself and the car. As speeds go up, safety goes down."

Mr. Kurtis worried that present day racers have gone about as fast as they can safely go.

Lucky ticket holders for the greatest spectacle in auto racing will see champions chase champions for the pot of gold.

Here's an up-to-the-minute run-down on what's new at the track this year.

Safety gets a big boost. New U. S. Auto Club rules make it a must to have the following on each car:

(1) Rear wrap-around bumper.

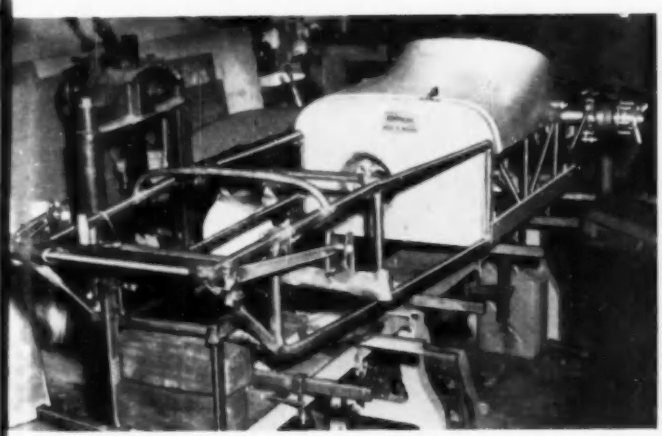
(2) A loop on the accelerator reaching over the driver's toes. It's so that the pedal can be worked if the accelerator springs fail.

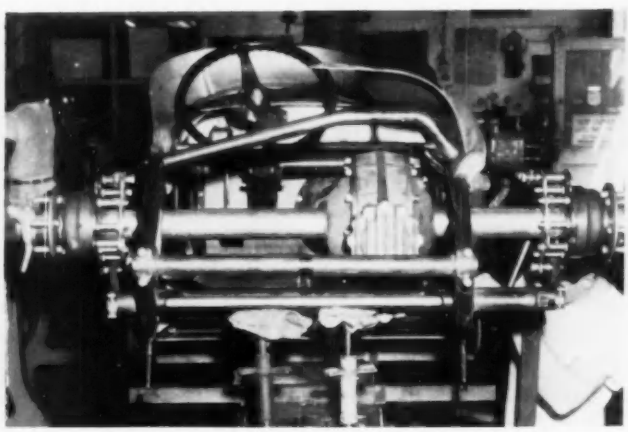
(3) Fiberglass protective coating on all fuel tanks.

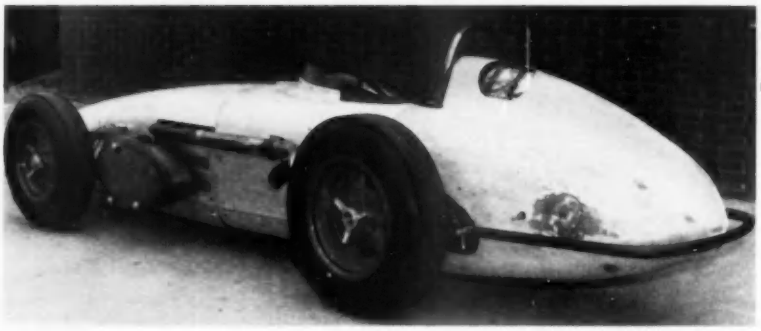
Meyer & Drake built nine new Offenhauser engines for the race. Six will go in the laid-over position, 18 deg from horizontal. Three will be mounted conventionally. The laid-over engines use an additional oil collector sump on the side of the crankcase. (*continued*)

KELSO AUTO DYNAMICS SPECIAL

In illustration below, shop view of Kelso Auto Dynamics Special shows upswept cowl, tubular construction, and magnesium firewall with engine mount opening. Illustration at right gives rear view of Lesovsky-designed Kelso Auto Dynamics Special. Notice tapering of rails rearward. The taper of 2 in. provides better streamlining and lighter weight. Notice difference of chassis spacing on rear axle. Chassis placement so far off center to left tends to throw weight on the left and allow better handling characteristics in the 800 left-hand turns.







This Dean Van Lines Special is one of six identical new cars designed for this year by A. J. Watson. Two of the cars were built by Wayne Ewing, Jr., during the winter months. Then Ewing joined Watson in building the four remaining cars. Photo shows side view of Dean Van Lines Special. Car features externally mounted oil tank; shortening of exhaust pipe by four ft ending in curve in front of rear wheel; wrap-around tubular rear bumper required by USAC rules this year; high roll bar outside of car; and high-speed fuel intake opening just above rear wrap-around bumper. The two-holed spring-loaded opening at top of car behind driver's head is still included, but only used as an auxiliary system in case the new one fails.

DEAN VAN LINES SPECIAL

The Offie's have two popular bore-stroke combinations — 4.281 bore by 4.375 stroke and 4.218 bore by 4.500 stroke. Use of the shorter 7½ in. connecting rod is almost standard and produces a rod length to stroke ratio of 1.76 to 1.

Compression ratios are creeping up and at least one engine will have close to 15 to 1. Average ratios are 14 to 14½ to 1.

Top engine rpm's are going up. They'll reach 6500 to 6700 on the long straightaways.

Dynamometer tests have shown 400 hp and a torque of 300 lb ft.

The Hillborn fuel injection system is on all the engines. It was first described in AUTOMOTIVE INDUSTRIES, May 1, 1949.

This year, Meyer & Drake designed and built a new experimental gear tower. It simplifies the overhead camshaft gear train. There are three less spur gears and two bevel gears are out. The magneto turns half engine speed and is now flange-mounted, supported on the front of the gear housing. There's a new fuel pump position. It drives off the half time gear. A new camshaft housing and cover have better appearance and fastening.

"We're trying out two prototype engines at the race. If we find no bugs, the new designs will be ready for the trade next year," says Leo Goossen, Design Engineer, Meyer & Drake Engineering Corp., Los Angeles.

Watch the Metal-Cal Special built by George Salih. His cars won in 1957 and 1958. And they touched off the trend to inclined engines. This year Salih is laying down his engine 15 deg from horizontal. Before, it was 18 deg.

Car weight is under 1600 lb. And it's 18 in. shorter than his earlier cars. From the ground at the fin the car's highest point is 37 in.

Driver of the Metal-Cal Special will sit on the left. The built-up right side of the cockpit should cut down wind buffeting during the 800 left-hand turns in the grind. This arrangement gives the driver a better view of the inside of the track.

Driver Jimmy Bryan's seat is only ¼-in. above the underpan. That's just 4½ in. above track level. How did they get him so low? One way was shifting the drive shaft to the driver's right instead of under him.

The Metal-Cal Special will mount a Meyer & Drake, 4-cyl 251-cu-in. engine. The body, fuel tanks, and special aluminum seat (fitted to the driver's contours) were designed and built by Quinn Epperly.

The car's frame is steel tubing in sizes from ¾ in. to 1½ in., both arc and gas welded. The body shell is 16 ga aluminum and the paneling is magnesium. Dzus fasteners attach it to the framework. Individual panels can be removed quickly without disturbing the others.

The car is 12 ft long. Its height

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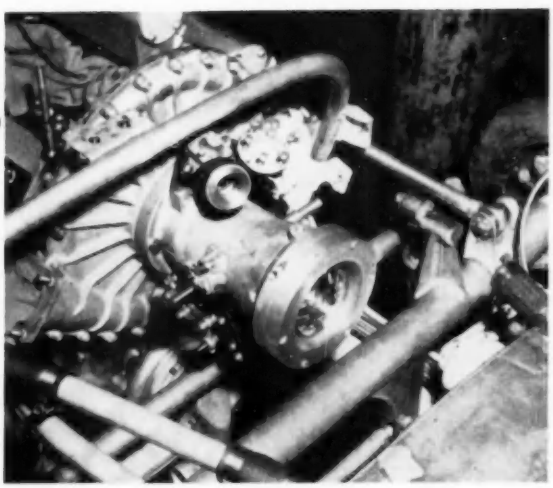
NOVI SPECIAL IMPROVEMENT



Major improvement in the Novi specials for the 1960 race is the introduction of chief mechanic Jean Marcenac's aircraft-type fuel injection system. The photo shows mounting on intake side of supercharger, located at its forward end. Chief advantage claimed for this new design is that air/fuel ratio stays constant at any engine speed. The Novi engines can reach 7500 rpm maximum.

Dry lake tests in California before race time indicated the unit performs well at speeds over 200 mph, and through lower speed ranges as well.

Reliability Program at Buick

By Joseph Geschelin
DETROIT EDITOR

MANY benefits are expected to stem from a newly introduced Reliability program at Buick which is based upon systems engineering. As will be evident later, the Reliability program is in its beginning stages and will come into full action just before the 1961 product rolls off the assembly line.

The importance of the project to Buick may be gained from the fact that the division recently changed its organization chart, making Reliability one of the principal activities, reporting directly to the general manager. At Buick reliability is defined "as the mathematical probability that a device will perform satisfactorily for a specified time under specified conditions of usage."

When one considers a complete motor car, it is evident that here is a large and complex mechanism with large numbers of parts in each major component, further complicated by numerous accessories of varying intricacy purchased from outside suppliers. The problem of control is far from simple, hence the emphasis upon systems, assuming that quality control takes care of the acceptability of individual pieces.

To attain its objective the division has set up a "Reliability and Quality Control Division," adequately staffed with specialists from the various activities of the plant—from engineering, from manufacturing, from field service, etc. In a general way the functions of this group are: (1) To establish reliability goals in numerical terms; (2) To predict reliability in the design phase, test phase, production phase, and customer service phase; (3) To promote corrective actions and design changes leading to improved reliability in each of the above phases.

That is the function. To make it work, the plant has been divided into four major manufacturing operations: engines; transmissions; axles; and final assembly. Each of these areas will be subjected to the full impact of the program to attain established minimum goals. These are aimed at reducing the attention usually required during the first 2000 miles or so in the life of the new car.

At the time this article was prepared the division had completed its organization and was proceeding with preliminary studies. The next phase of the program will be the installation, later this year, of special test facilities associated with systems checking. This equipment has been designed and is being built and will be installed without delay.

In brief, they will install in the engine plant a group of special dynamometers for this sampling inspection of assembled engines taken at random off the engine assembly line. In the transmission department they will have special test stands designed to test transmissions directly coupled with engines to provide a systems inspection. Incidentally, the test stand will be provided with a rotating mass to stimulate the total weight of the car while a test is in progress.

Finally, there will be a number of special chassis dynamometers, designed for driving all four wheels of a car. A random sampling of cars taken directly from the assembly line will be tested here as a routine operation. This equipment has facilities for checking brakes, suspension, and drive, as well as accessories such as windshield wipers, electrical system, air conditioning, etc. The chassis rolls have been made wide enough to permit normal running of the vehicle, as well as a section of the rolls that simulates a rough road so as to test for the action of the suspension system, vibration, and associated effects.

Test facilities for engines and transmissions doubtless will be housed in a special enclosure in each plant. The chassis test equipment may require a separate

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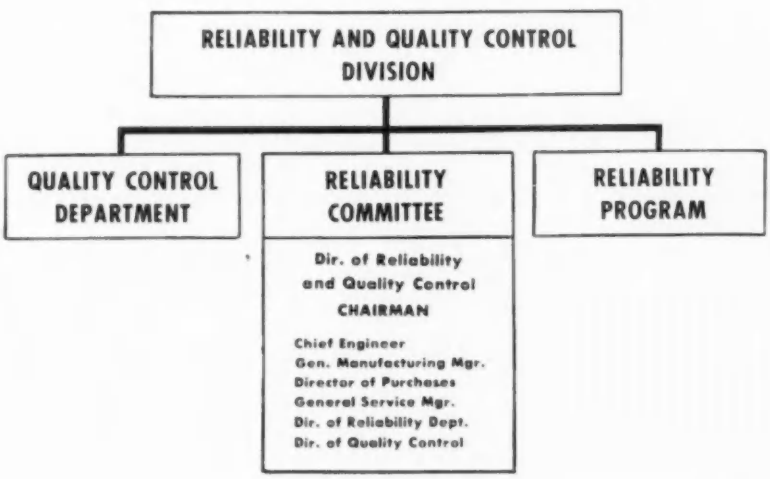
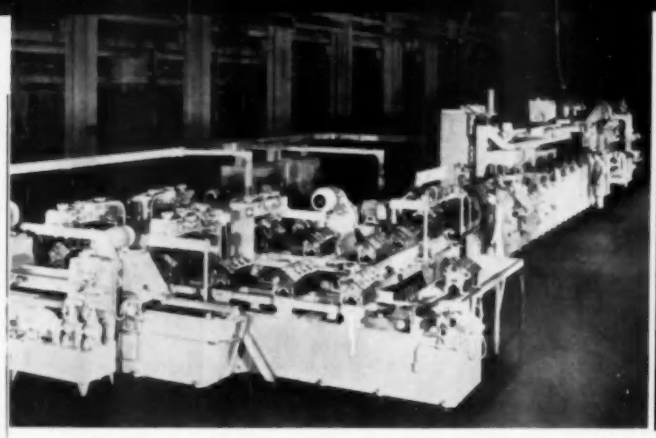
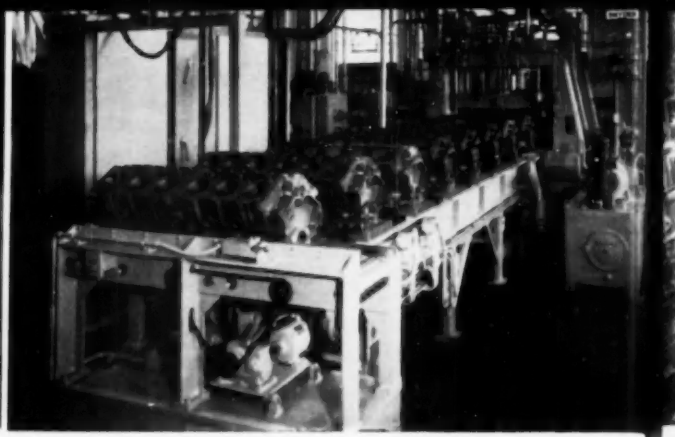
ORGANIZATION CHART





Perspective view of Cincinnati 36-station inline transfer machine at the start of the cylinder block line. In the background, at the extreme right, is the horizontal surface broaching machine, largest in the world. In the foreground is the final section, arranged in U-shape for space economy. (Note: This is a view taken on the erection floor prior to shipment to GMC.)



This 7-station Snyder transfer machine is used only on 12-cylinder blocks. Operations handled in this machine include: rough-bore cam and crank bearings; semi-finish distributor hole; finish-bore cam bearings; ream four holes.

Interchangeable Parts Facilitate Production of V-6 and V-12 Engines

By Joseph Geschelin
DETROIT EDITOR

LAST year (AI, August 15, 1959) GMC Truck & Coach Division announced the development of a revolutionary line of V-6 and V-12 gasoline engines. It is an integrated family of engines consisting of three V-6's of different bore; and one V-12, the V-6 blocks being produced from a single basic block. From the standpoint of manufacturing economy and field service the outstanding feature of the family lies in the unusual number of interchangeable parts.

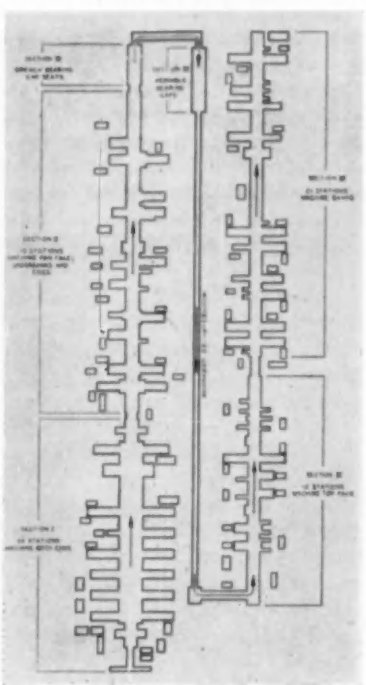
From the standpoint of manufacturing alone, this results in many identical operations for the entire range of models right up to the point of final assembly. Where variations in dimensions do occur, the machine tools have been designed to accommodate for the differences. Out of some 580 operations on the V-6 line, over 540 apply equally as well for the V-12. As will be evident later, V-6 and V-12 blocks are processed over the same machine lines, except for a few variations to be noted. A single cylinder head satisfies all engines—two on a V-6, four on a V-12. The only variation is that one type of head employs hardened valve inserts.

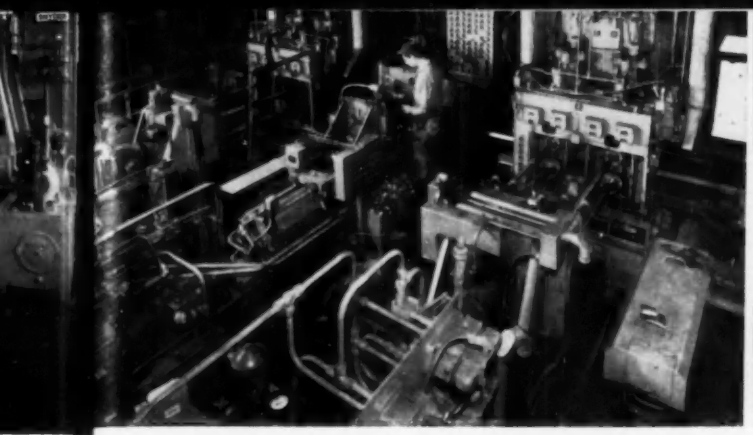
It is noteworthy that the concept of engine design was coordinated with the manufacturing procedures at the very outset of the program, making it possible to design the plant and equipment specifically for the project. The engine plant features a two story layout having a total floor space of 619,550 sq ft. The first floor, with an area of 323,388 sq ft accommodates all of the equipment for machining as well as space for rough stock storage. The second floor, primarily for engine assembly, testing, and storing of finished engines, has a floor space of 296,162 sq ft.

Altogether the engine plant contains more than 192 new special machines, including the latest types of transfer machines known to the art. It has been treated to the most modern kind of mechanization to facilitate handling without manual effort wherever that is justified.

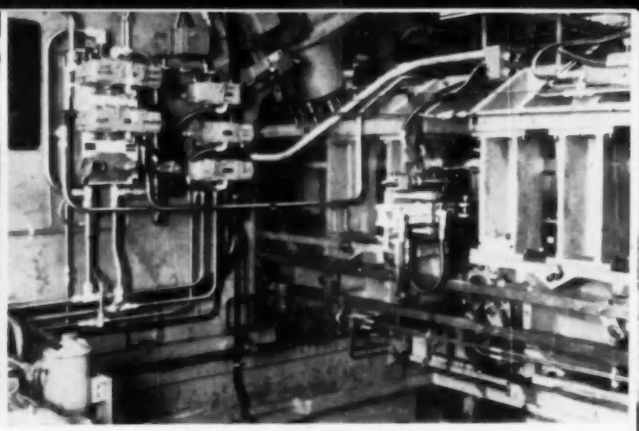
In most respects the transfer

Schematic layout of the portion of the cylinder block machining department equipped with the four Cross Transfermatic sections.





Perspective view of the Natco horizontal boring machine on V-6 blocks. It is tooled to finish-bore the cam and crank bores, finish-ream the distributor hole, finish-ream two dowel holes in each end.



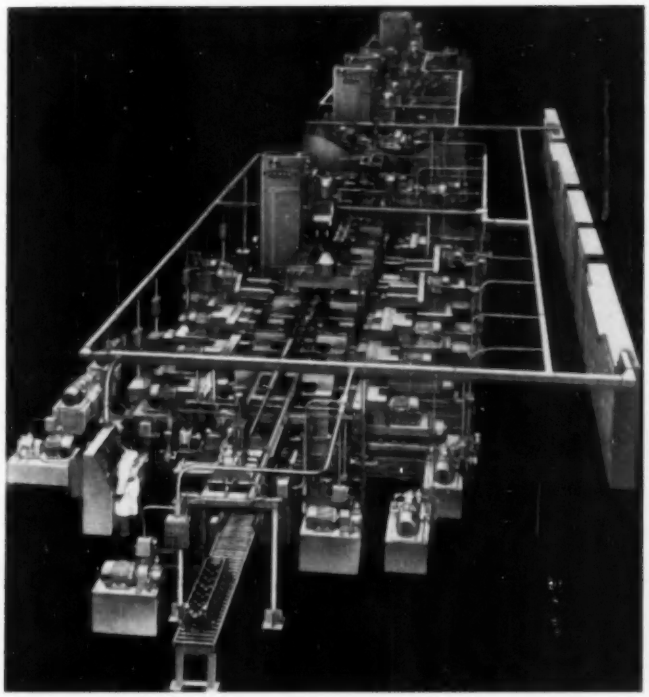
Ex-Cell-O machines for boring cylinder bores are equipped with a special shuttle mechanism to accommodate V-6 and V-12 blocks. For the V-6 there are two indexes carrying the leading block some 0.874 in. forward of the final position of a V-12 block. Total travel of the shuttle becomes 1.748 in. A perspective view of the shuttle mechanism is seen here.

machines are of advanced types such as are current in passenger car engine plants. One major distinction, however, is that the equipment generally is much more flexible to cope with the variations in block sizes and bores. And they have to anticipate and accommodate product changes over a longer period of time.

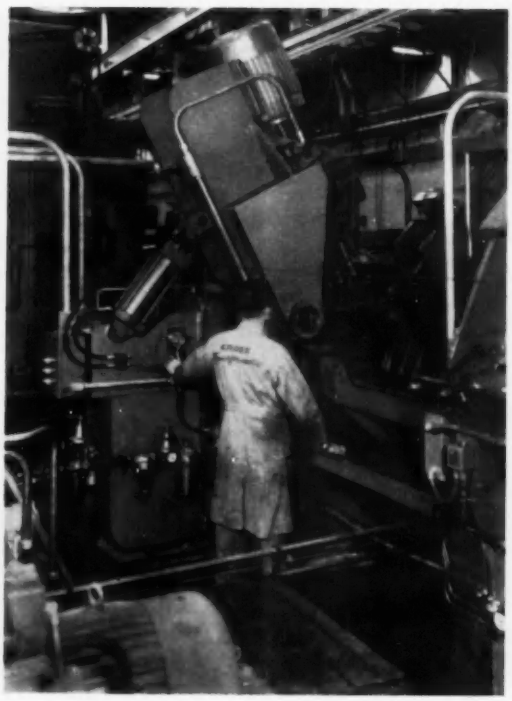
Obviously, the blocks have to be processed in batches, in economic lot sizes. Thus, the V-6's go through separately in larger numbers than do V-12's. However, the changes from one lot to another require a minimum of set-up time.

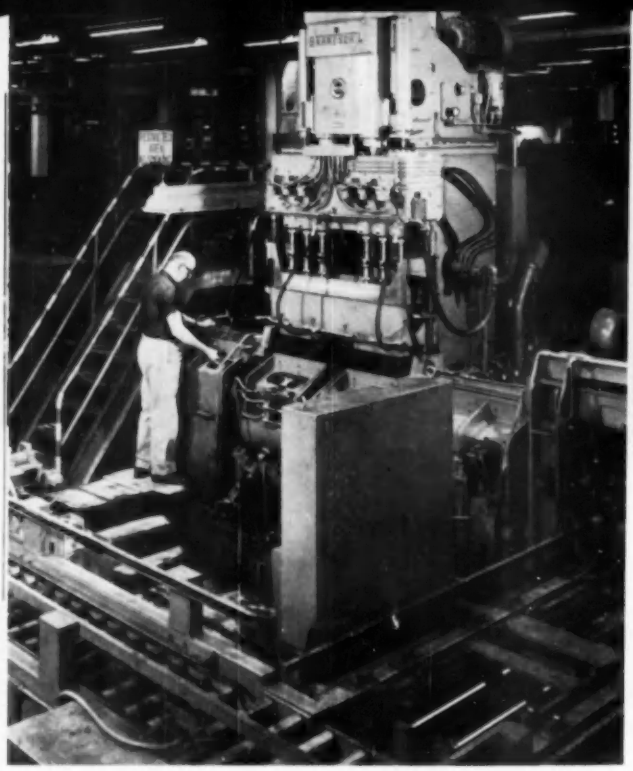
Among the equipment items are some distinctive machines. One of these is the Cincinnati horizontal surface broaching machine which handles both V-6 and V-12 cylinder blocks and is the largest and heaviest machine of its kind built to date. Similarly, the plant has another first: the first completely mechanized crankpin grinding machine to be installed in the industry. Basically, this Norton machine

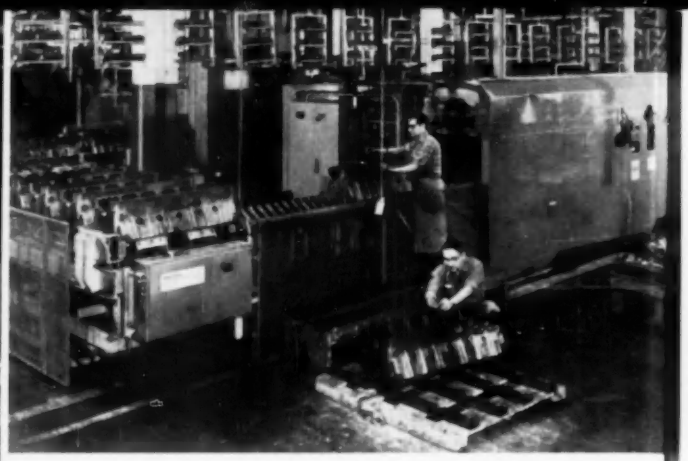
Perspective view of the first section of the Cross Transfermatic with cylinder blocks entering the loading station from the foreground. (Note: this view taken on the erection floor at Cross.)



The Cross Transfermatic is replete with unique design features. One example, seen here is the arrangement for facilitating tool changes at Station 12 of the second section. The head is normally in vertical position. When tool change is required, it is tilted as shown by means of the hydraulic cylinder to the left.







Sundstrand horizontal surface broaching machine on the cylinder block line. It is used for the finish-broaching of the bearing half-round line and bearing cap locks.

One of the Barnesdril honing machines fitted with six spindles for handling two V-6 blocks at a time.

has six-stations, one unit for each pin. However, it also includes a seventh machine to take care of down-time.

Due to the emphasis upon automaticity throughout the operation, tool control has been given exceptional attention. Each section of the machine line is served by one of the familiar Cross tool boards. These do double duty: they store a complete set of sharpened tools for each station; and they have tool life counters for each type of tool, set to the anticipated tool life. When the pointer reaches zero on any of the counters, the machine is automatically stopped for tool replacement.

Cleanliness is a must here. Throughout the machine lines there are the familiar Centri-Spray washing machines specifically designed for the individual part. In addition there is a complete system of overhead dust collecting ducts, arranged to remove dust and dirt at work stations and over the chip conveyor.

Quality control naturally is an essential part of this operation. In addition to automatic or manual gaging devices, each of the transfer machines is equipped with suitable probes and gaging stations.

Finally there is a management feature of uncommon interest. We refer to the use of banks of parts between major stations on the transfer lines, supplying about an hour of bank to take care of unscheduled shut-down of any of the stations.

Because of the enormous amount

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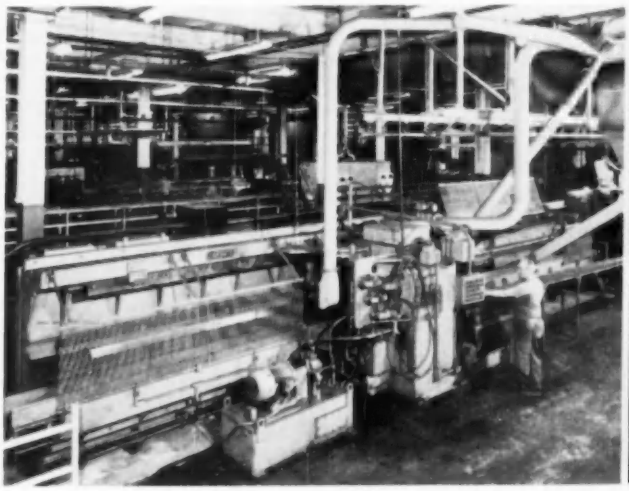
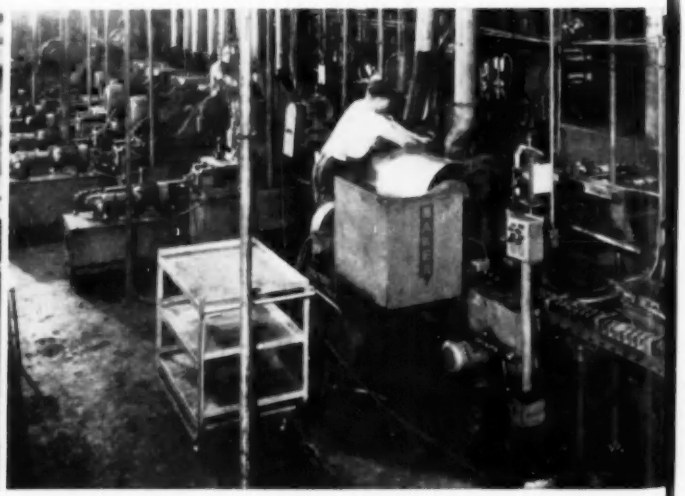
The large LaPointe horizontal surface broaching machine on the compact main bearing cap line. It broaches half-round diameter and seat face, and chamfers two edges.



Perspective of the Baker transfer machine for finishing main bearing caps. Caps are drilled, milled, slotted, and cut apart.



Advances in Automatic Controls Highlighted in Machine Tool Conference

By Charles A. Weinert
EASTERN EDITOR

At the 24th Machine Tool Forum sponsored by Westinghouse Electric Corp., electrical engineers from the automotive, machine tool, and equipment companies recently exchanged ideas on latest developments. Subjects ranged from machine tool drives and automatic controls, to a discussion on electro-hydraulic forming.

The meeting, held at Pittsburgh, Pa., on April 26-27, had an attendance of around 375. Altogether, 19 technical papers were presented, followed by audience question-and-answer periods.

Alan C. Mattison, president, and Ludlow King, executive vice-president of the National Machine Tool Builders' Association, also participated as guest speakers. Both presented views on foreign competition, and indicated the answer was American "brains" or superior technology in developing machine tools that would turn out more products at lower cost.

Numerical Control

Westinghouse has introduced a new numerical control system, and it was described at the meeting by D. A. Poepsel, project engineer, Machine Tool Group, Systems Control Engineering, Westinghouse Electric Corp.

Designed for point-to-point control, the system is a digital, all-transistorized, static type of modular construction. It is called PRODAC (programmed digital automatic control).

The control operates on the principle of positioning to an accuracy band rather than to a specific point —i.e., it positions the machine to an electrical system accuracy of 0.001-in. band. When positioning, the machine is moved at maximum positioning speed and held at that rate until a predetermined distance from the next machining location is reached. Then the speed is decelerated in steps for final positioning within the 0.001-in. band.

For position-measuring a rotary pulse generator is used to provide feed-back signals. This device is a new Westinghouse product that has been trade-named ROTRAC. Another new device used in the system is a Westinghouse multiple-pole machine tool relay employed for a-c control circuitry.

Application of the PRODAC system to a Gisholt Fastermatic turret lathe was the subject of another presentation by Leonard Hesse, chief electrical engineer, Gisholt Machine Co. He reported that the installation of this tape-controlled system is relatively simple; and that even though the machine has only been in operation for a few months, savings are apparent. Except for tool setting, all setup and operating procedures are programmed on the tape.

Electro-Hydraulic Forming

Metal-forming by the electro-hydraulic method — employing an electrical discharge in a fluid medium—was discussed by L. W. Herchenroeder, Machine Tool Industry Industrial Engineering, Westinghouse Electric Corp., from the standpoint of the electrical components which might be used. He indicated that "experimental work is under way in a number of locations to determine its place as a manufacturing process." We understand one of these "locations" is a large automotive manufacturer.

In electro-hydraulic forming—like explosive-forming in principle —a shock wave moves the workpiece metal against a die to make the shape. Source of the shock wave is electrical energy stored in a bank of capacitors that is suddenly discharged across a gap within the fluid medium. Voltage at the gap is likely to be on the order of 20 kv.

The process is intended mainly for hard-to-form metals and shapes which are difficult or impossible to handle with conventional equipment, and where the runs are relatively small.

Protected Motors

Electric motors for machine tools are now available with a new approach to built-in protection. John J. Courtin, senior design engineer, Westinghouse Electric Corp., explained the basic principles of this innovation.

The a-c motors, trade-named Guardistor, are equipped with fast-acting, temperature-sensing semiconductors called positive-temperature-coefficient (PTC) thermistors. These small PTC thermistors, usually three, are embedded in the motor windings. Therefore they react to winding temperature.

When the winding reaches the predetermined hot critical temperature, such as would occur in a stalled rotor condition, the PTC thermistors have the characteristic of almost instantly multiplying their resistance a hundred or more times. This increase of resistance, in turn, causes the accompanying motor control relay or contractor

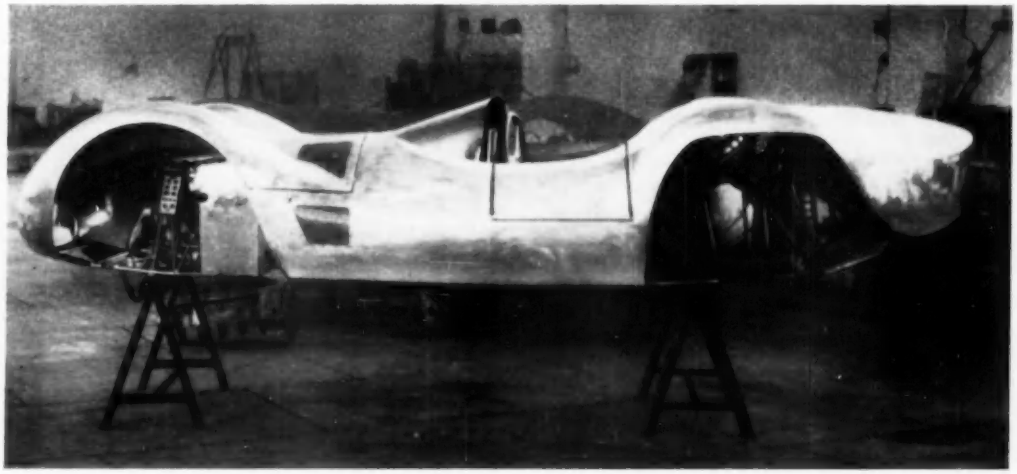
(*Turn to page* 114, *please*)

New MASERATI "Birdcage"

Sports 4 Cylinder Design Features

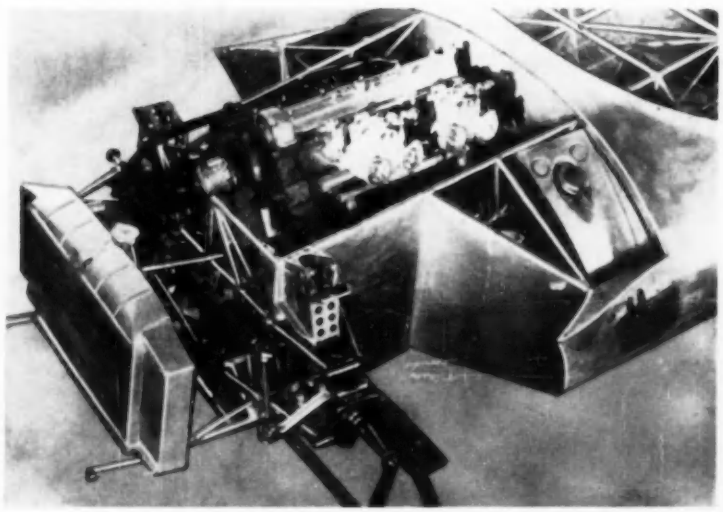
Sterling Moss driving the "Birdcage" Maserati in the Sebring International "Grand Prix of Endurance." Total driving of a vehicle in this race easily equals 100,000 mi of highway driving.

Side view of Maserati. At time of withdrawal at Sebring average speed was 87.54 as compared to the race winner of 84.927 mph, or the record set by Peter Collins-Phil Hill in 1958 driving a Ferrari at 86.67 mph.



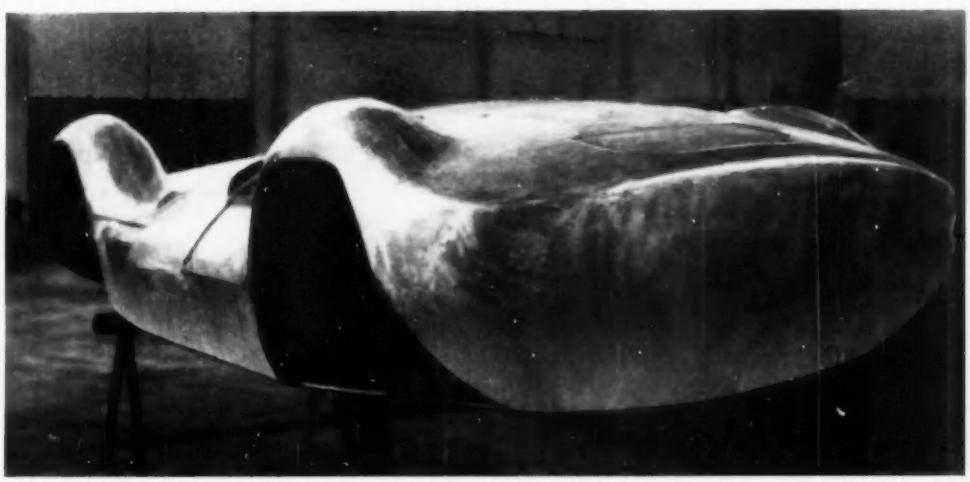
By Bill Smythe

THE tube-frame construction of the new Maserati sports 4 cylinder has prompted the popular name of this vehicle design as "Birdcage." The accompanying views show clearly the unique design features of the frame, suspension, skin and 4 cylinder in-line engine inclined at 45 degrees. Although withdrawn at Sebring Races after 8 hrs, 4 mins and 42 sec when in a position 30 miles ahead of second place, retirement because of gearbox trouble should not be viewed as discounting the effectiveness of body, engine and suspension design. This performance, plus two previous wins, was sufficient endorsement for the quite radical, extremely light but rigid frame construction. Previously this year both Carroll Shelby and Sterling Moss have won races in Cuba and Riverside, California, driving the Maserati (Birdcage).



Frontal view shows engine inclined at 45 degrees and also the front suspension. It very graphically illustrates the requirements for rigidity met by the tube construction, despite the radical, light-weight design.

Rear view of the Maserati. Although the twelve hour Sebring race is never won solely by performance in the first eight hours, all stages of the race provide some opportunities for close observation of both weak points and strong points of new designs.



SPECIFICATIONS for New Maserati Sports 4 Cylinder (Birdcage)

Engine

4 cylinder in line. Inclined at 45 deg.

	Type 60	Type 61
Bore	99mm	100mm
Stroke	75	92
Displacement	1994cc	2690cc

Hemispherical combustion chambers, double overhead camshafts. Valves controlled by fingers and hairpin springs. Helicoid gear cam drive. Twin ignition by distributor, Forced lubrication by gear pump & tank with cooler. Coolant circulated by centrifugal pump.

Horsepower	195	240
RPM	7800	7000
Compression ratio	9.5:1	9.5:1

Clutch

Multiple dry disc

Gear Box

Five forward speeds and reverse in unit with 2F differential

Differential Unit

In unit with transmission. Assembly rigidly fixed to frame. De Dion axle.

Chassis

EXTREMELY LIGHT. Very rigid tube frame construction.

Wheelbase	2200mm
Front track	1250
Rear track	1200

Suspension

Front: Independent with coil spring and telescopic shock absorbers.

Rear: Transverse leaf spring with shock absorbers.

Steering Rack and Pinion

Brakes

Disc front and rear. Front 355mm. rear 314mm.

Wheels

Wire type.
Front 4.50 x 16.
Rear 6.00 x 16.

Tires

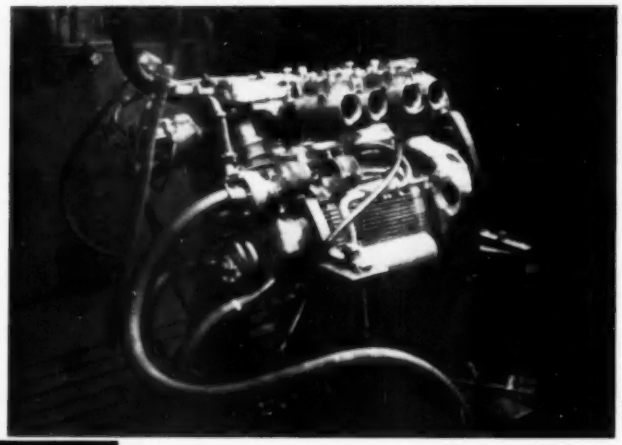
Front 5.25 x 16.
Rear 6.50 x 16.

Weight

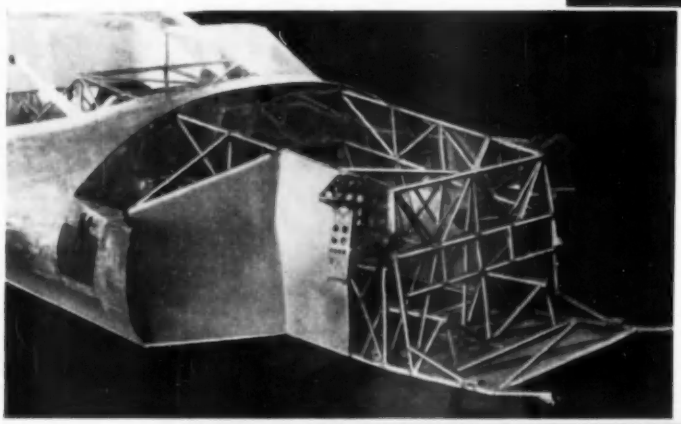
1255 pounds dry.

MORE

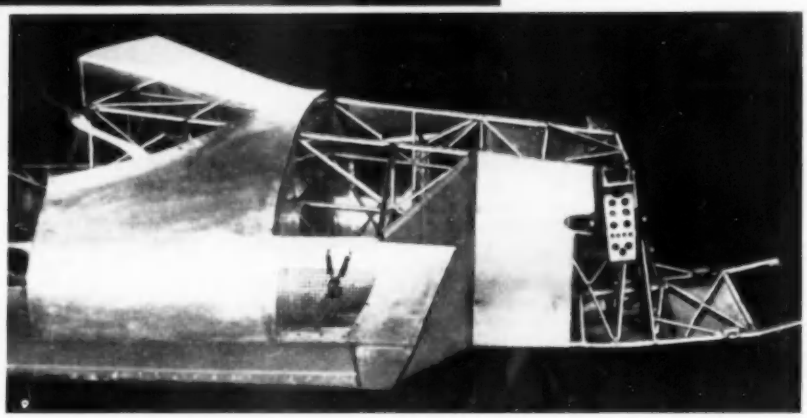
MASERATI CONTINUED

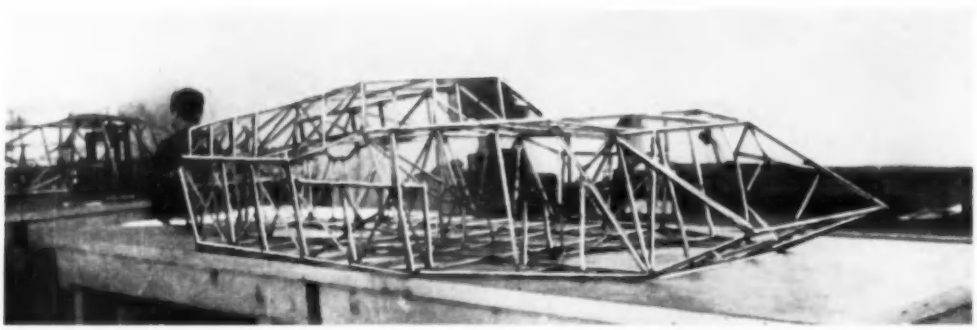


Right: Another view of the Maserati 4 cylinder in-line engine inclined at 45 degrees on test. Features include hemispherical combustion chambers, double overhead camshafts and helicoid gear cam drive. Twin ignition. Forced lubrication by gear pump and tank with cooler.



Left and below: Three self-explanatory views of typical aspects of the tubular frame "Birdcage" construction.





. . . . . Trends in the CONSTRUCTION EQUIPMENT INDUSTRY

Contractors Air Views at Earthmoving Industry Conference

By Kenneth Rose
MID-WEST EDITOR

CONSTRUCTION equipment manufacturers were asked by contractors to provide machines with higher availability, to help contractors reduce the losses due to downtime. Additional machine controls would be well received by the contractors, said a panel at the 11th Annual Earthmoving Industry Conference at Peoria last month, if they increased production without increasing maintenance costs.

What Users Want

It is very important that machinery be designed with ease of disassembly in mind, said one member of the panel, so that maintenance men can get at the engine, transmission, and final drive without tearing apart the entire machine. Some of the features the contractors thought would be desirable were:

1) More rugged transmissions and drive units.

2) An automatic fuel cut-off to stop the equipment when engine temperature goes above the danger point.

3) Higher horsepower-to-weight ratio in the equipment.

4) Use of structural materials of higher abrasion resistance, so equipment can endure severe service without excessive wear.

5) Individual wheel suspension on haulers.

6) Heavier bottom beams and other members in haulers, to permit loading from large excavators without springing the hauler body.

7) Some sort of retarder on rock haulers, in addition to brakes.

8) A puncture- and blowout-proof tire on rubber-tired equipment.

9) Automatic transmissions, but trouble-free.

10) Fool-proof controls on all equipment.

The contractors agreed that manufacturers have done a remarkable job with equipment design to date, as indicated by the fact that excavation costs have risen very little over the past 30 to 40 years while labor costs were quadrupling, and more. Contractors still are caught in a rising cost squeeze, however, and want higher producing, lower maintenance cost machinery as a solution to their problem.

On some contracts, mobility is of first importance, while on others high production is the top requirement. A variety of equipment is necessary to meet all conditions. The rubber-tired bulldozer is here to stay, if the tires can be improved, they agreed. It is better in every surface except rock. Cost of tires is extremely high—of the $80,000 cost of a piece of equipment, $10,000 may represent tires.

Power Plants of the Future

New power plants came in for consideration in papers by L. J. Nuttall, Project Engineer, Small Aircraft Engine Div., General Electric Co., and John M. Stephenson, Project Engineer, Advanced Gas Turbines, Lycoming Div., Avco Corp., upon gas turbines, and by Dr. H. K. Ihrig, Vice-Pres. in Charge of Research, Allis-Chalmers Mfg. Co., upon the fuel cell. The gas turbine, said Mr. Nuttall, now getting attention in nearly all prime mover applications, should offer advantages in earthmoving equipment through (1) high power-to-weight-ratio; (2) high power-to-volume ratio; (3) a 2.5-to-1 torque multiplication without a converter; (4) low vibration; (5) ease of maintenance. Cold weather starts, down to minus 65 F, can be made easily. It can give increased useful load, greater tractive effort, and higher vehicle speed, all with a simplified transmission. This adds up to increased operating economy. While there is some sacrifice in fuel economy, additional fuel can be carried in the space saved.

Mr. Stephenson stated that the main drawback of the gas turbine at present is that, unless a large exhaust heat regenerator is fitted to it, fuel consumption is 50 to 100 per cent above that of a Diesel engine. The outstanding feature is that, in a very small and lightweight package, virtually unlimited power can be produced. While this cannot usually be made use of in a vehicle already designed about a reciprocating engine, a new generation of large, highly mobile vehicles can be designed around a small lightweight turbine delivering 1000 hp and up. It is in this size range that the gas turbine becomes interesting as a mobile power plant. Its weight will be only about one-twentieth that of a Diesel of the same power output. Specific weight for the gas turbine in this size might be about 1 lb per hp.

(*Turn to page* 110, *please*)

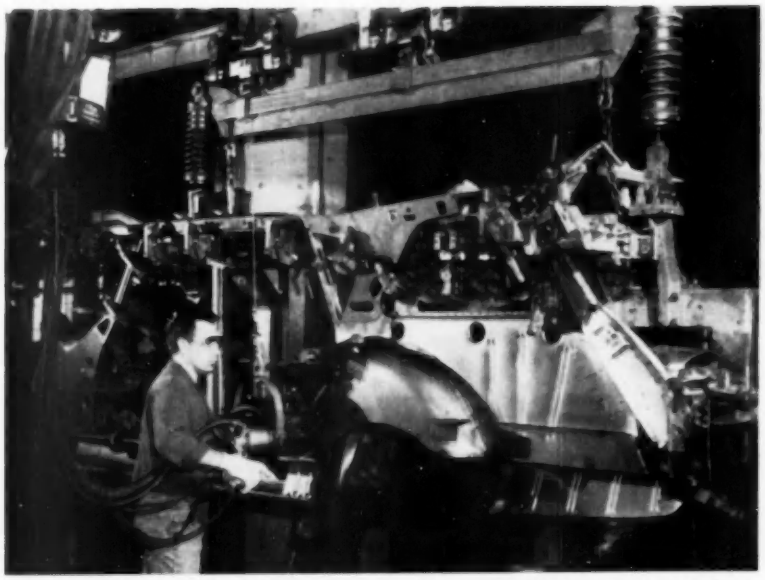
Efficient Conveyor Setup for Valiant Production at Chrysler's Hamtramck Plant

By Joseph Geschelin
DETROIT EDITOR

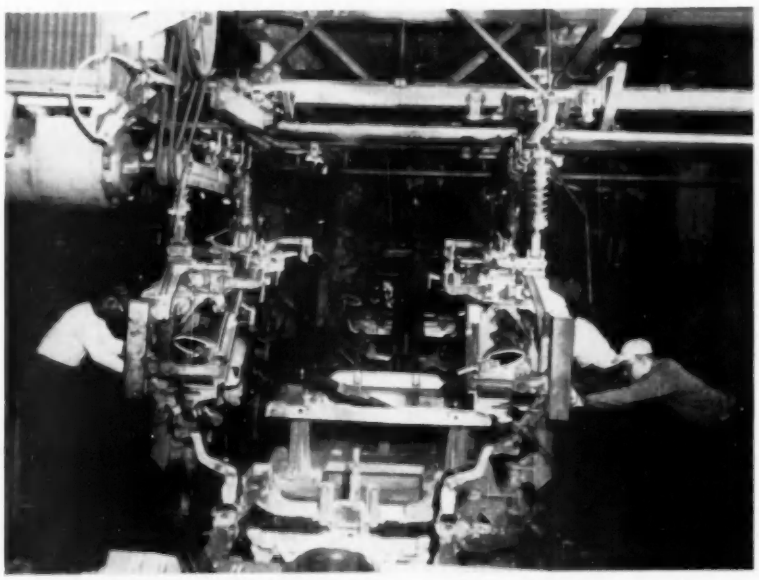
VALIANT bodies of fully unitized construction are pouring out of the body shop at Chrysler's Hamtramck Assembly Plant at the rate of one every 60 seconds. This is rather exceptional performance when one takes into account the enormous amount of detail associated with the manufacture of this body as well as the extensive inspection procedures to which it is subjected.

As mentioned in an earlier article (see AI, Jan. 15) dealing with this plant, separate facilities are provided in the body plant for the Dodge and Dart line as well as for Valiant. Although this is a very old multi-story plant, some of the disadvantages of multiple floor operation have been washed out by the ingenious arrangement of conveyors for transporting sub-assemblies and bodies from one floor to another. This is particularly true of the gate line assembly on the 7th floor as will be described later.

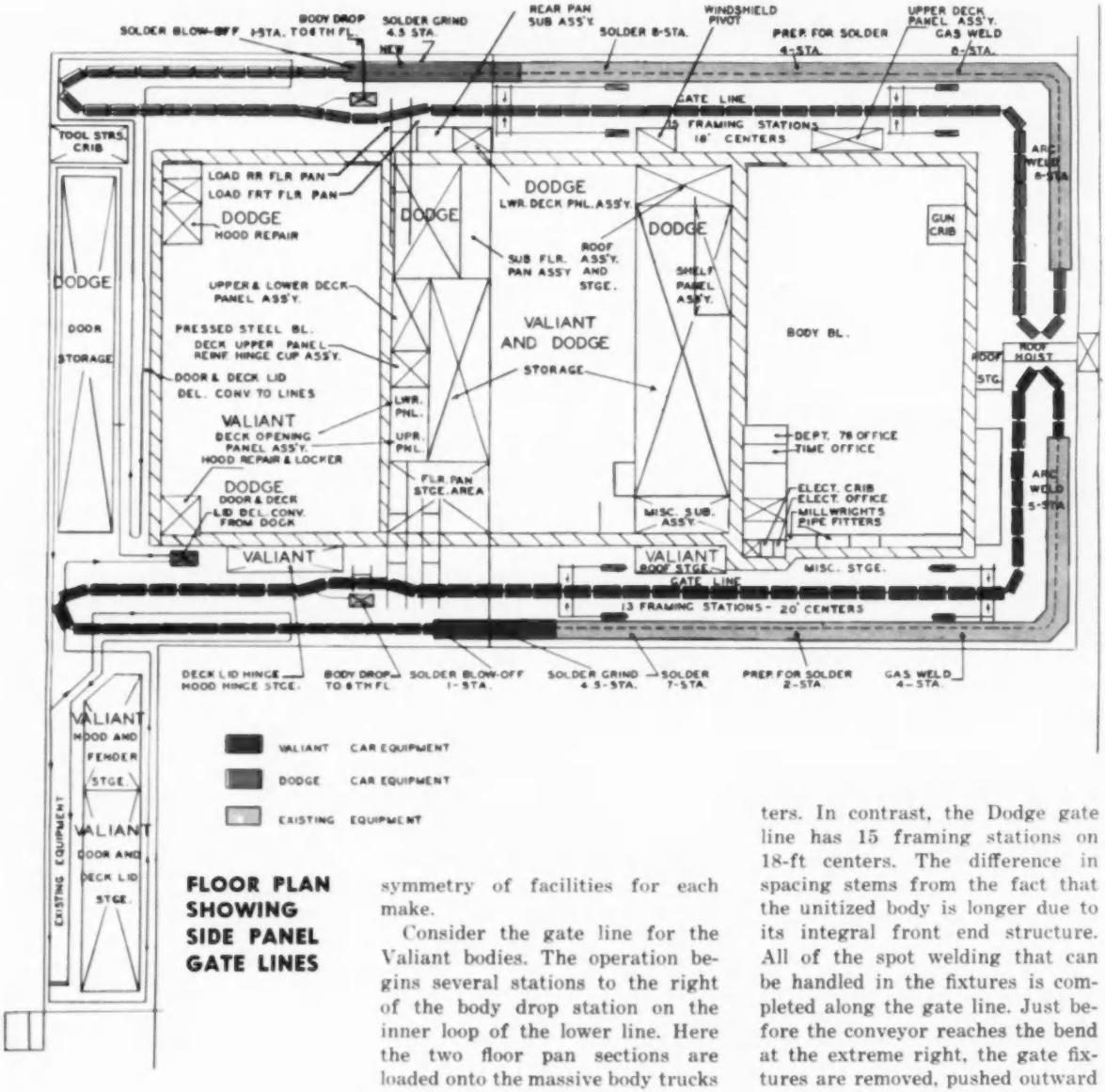
Initial stages of body assembly are located on the 8th floor. First major phase is the preparation of right and left hand side panel assemblies on parallel gate lines. For this purpose, quarter panel assemblies first are made up in stationary fixtures, then these are transported to the gate line, serving as the backbone for the side panel assembly. Located at both ends of each of these gate lines is an automatically-operated elevator. As the gate fixtures reach the end of the line, they are engaged by an overhead transfer bar and moved into the elevator, lowerator in this instance. The transfer bar then retracts and the lowerator carries the loaded gate to the 7th floor gate line. Here a transfer bar reaches in to move the gate out of the lowerator, permitting the latter to return to the 8th floor. Later on when the gate fixture is removed on the main gate line, the empty gate returns to the start of the



Close-up of one of the stations along the side panel gate line on the 8th floor



Part of main gate line for framing the entire body. Underbodies may be seen coming in from the foreground along the conveyor. At this point gate fixtures with side panel assemblies are being pushed into place from both sides of the conveyor, then locked into place



FLOOR PLAN SHOWING SIDE PANEL GATE LINES

side panel gate line on the 8th floor via an elevator at the other end of the line.

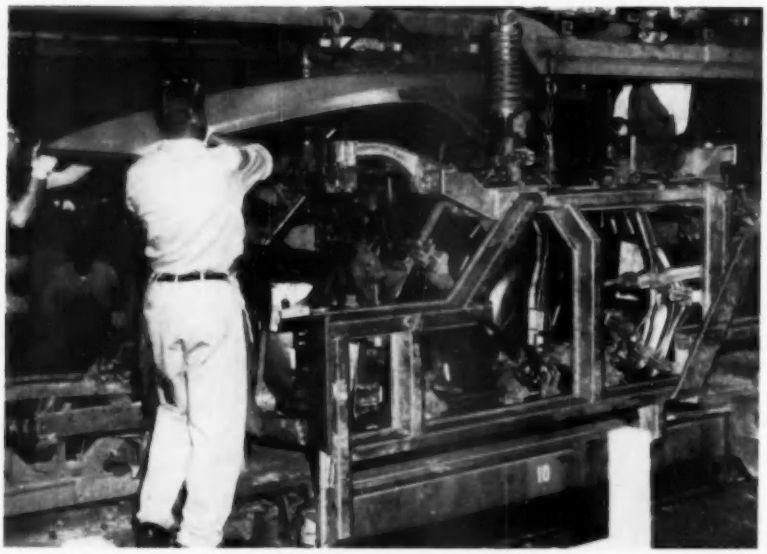
To give some impression of how the floor plan is arranged for a specific operation, we have reproduced a layout of the 7th floor area where the body assembly is completed on the main gate line. It will be noted that these operations are located along the periphery of the building, the entire area in the center being devoted to service facilities, sub-assemblies, and storage of parts. The closed loop at the top handles Dodge and Dart; the loop at the lower edge is devoted exclusively to Valiant. One obvious feature of the floor plan is the nice symmetry of facilities for each make.

Consider the gate line for the Valiant bodies. The operation begins several stations to the right of the body drop station on the inner loop of the lower line. Here the two floor pan sections are loaded onto the massive body trucks and welded together. Trucks continue on the conveyor line leading to the right, entering the main gate line as indicated on the sketch.

At each end of the gate line is the pair of automatic lifts mentioned earlier. The pair at the left are lowerators which deliver loaded side panel gates from the 8th floor. As the loaded gate is moved out of the lowerator, it comes to rest on a rail to one side of the gate line. At the position marked with arrows on the sketch, as the body truck moves by, operators push the side panel gates on both sides into engagement with the underbody, and lock the gates securely in place.

The gate line for the Valiant has 13 framing stations on 20-ft centers. In contrast, the Dodge gate line has 15 framing stations on 18-ft centers. The difference in spacing stems from the fact that the unitized body is longer due to its integral front end structure. All of the spot welding that can be handled in the fixtures is completed along the gate line. Just before the conveyor reaches the bend at the extreme right, the gate fixtures are removed, pushed outward on the rails and are ready to return to the 8th floor on the elevators at the extreme right.

After the gates have been removed, the bodies move along a section of the line that may be termed a reweld line. Here the operators complete numerous welds that cannot be reached while on the gate line; also add weld spots that may have been missed by preceding operators. This is a part of the quality control system in this department. Inspectors are assigned on the gate line to make sure that the proper sequence and spacing of welds is performed by the operators. In addition, there are inspectors at the end of the gate line who watch for spots that



View along main gate line; here the roof is being installed over other sheet metal.

Metal finishing operations near the end of the body-in-white line. Note that bodies are being handled suspended from the overhead conveyor.

One of the conveyor lines employed to effect transfer of bodies from one floor to another. Here bodies are being transported from the floor above, this view being taken at the drop and bend in the line.

may have been missed.

The conveyor line then bends downward as shown for the return loop through the ventilated booth area. Workers in the booth area handle the gas welding and arc welding of specified sections of the body. This is followed by metal grinding, torch soldering, and grinding of soldered joints.

By this time the bodies are just emerging from the booth exit at the lower left. The remaining section of the conveyor, up to the body drop on the inner course, as indicated, is used for the installation of doors, hood, deck lid, and other parts. Then the bodies are removed from the conveyor and lowered through the body drop to the 6th floor.

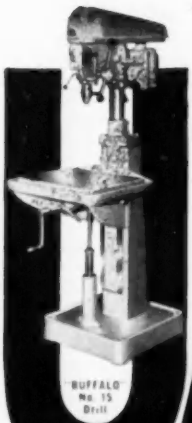
The 6th floor has considerably more complication of process. It has metal finishing lines for Valiant and Dodge bodies in one section; it also contains all of the equipment for Bonderizing and priming of bodies. Metal finishing lines have a total of 40 stations.

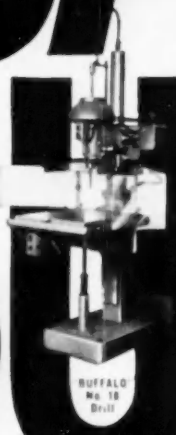
It may be of interest to digress at this point to highlight some of the many quality controls impressed on the operation up to this stage. Mention was made earlier of the careful attention to location and spacing of welds. Later on, similar scrutiny is given to metal fits—doors, hoods, deck lids, openings, etc. In addition, there is the matter of surface finish which must pass the watchful eye of the final inspector at the end of the metal finishing line. All of these operations must be accepted before a body is permitted to enter the paint shop.

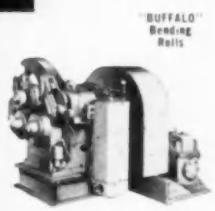
Up to now the bodies have been moving on individual trucks. Now they are transferred to overhead conveyors and start the lengthy sequence of operations in the paint shop. First step is to produce the protective phosphate coating in an enormous, six-station spray and dip Bonderizing unit. This is followed by dry-off in ovens some 150-ft long, then a mist spray and a cooling tunnel for reducing metal temperature to around 120 F. As

(*Turn to page* 138, *please*)

QUALITY-BUILT







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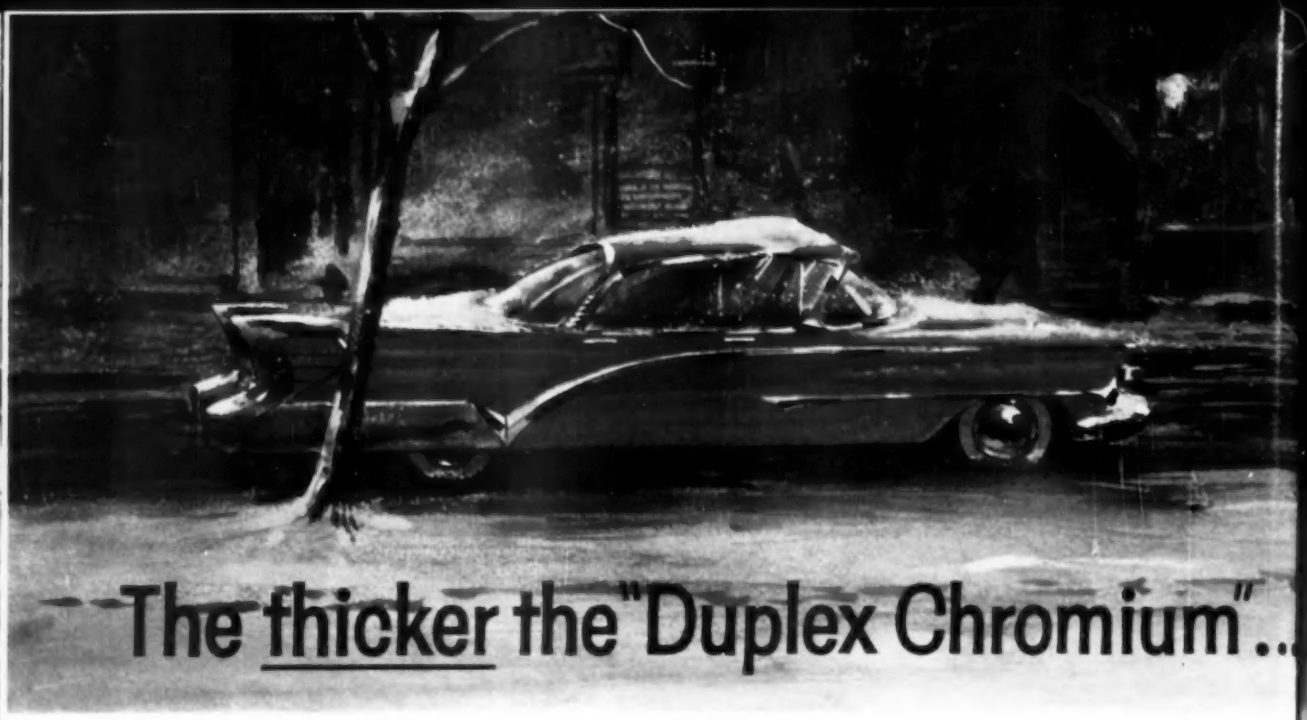

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By every modern test, M&T "Duplex Chromium" has clearly demonstrated its superiority. CASS tests on steel and zinc die cast panels show that corrosion resistance is multiplied many times over. Corrodkote tests also confirm a 5 to 10 times increase in durability. Initial results of 2-year outdoor exposure of thicker chromium to Detroit atmospheres suggest the same pattern of protection.

You'll do more to prolong life of the bright finish by plating thicker "Duplex Chromium" than with any other change in plating specifications. A minimum chromium thickness of 50 millionths of an inch works a dramatic improvement. 100 millionths works wonders.

For plating thicker chromium, Unichrome SRHS® Chromium baths offer substantial operating advantages . . . such as higher speed, self regulation, and better coverage in recesses. More important, they offer the only way to get the right type of deposit. M&T "Duplex Chromium" combines two deposits from these baths. One layer is crack-free to block entry of corrosives to underlying metal; and to give better distribution of the plate so that recesses, too, get ample thickness with no grayness or burning at edges. The other layer has an extremely fine crack-pattern to avoid localized corrosion experienced at tiny surface defects in zinc die castings.

Existing production equipment of sufficient capacity can be used with minor modifications. Send for technical data; or for an M&T plating engineer to survey your plant requirements.

(1) Corrodkote test: a standard, uniform, highly corrosive slurry is applied on test piece, which is then placed in non-condensing humidity cabinet. Each cycle is 16 hours.

(2) CASS test: copper-accelerated acetic acid salt spray.

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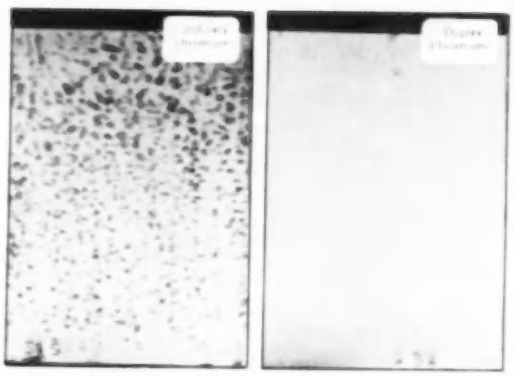
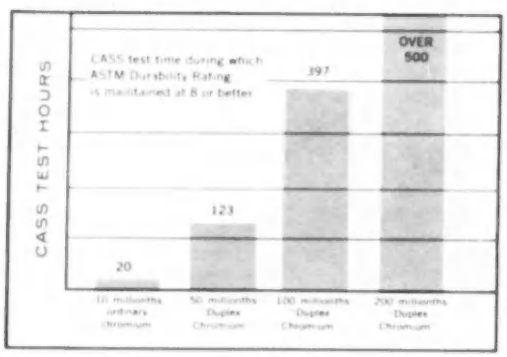
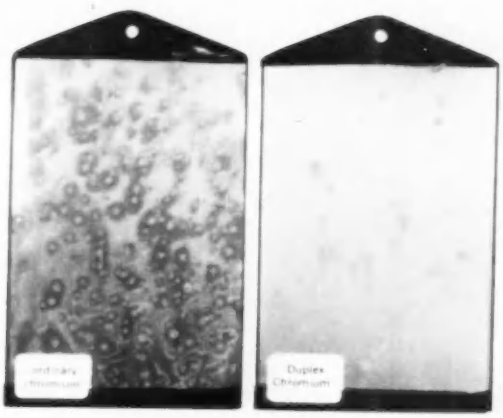


The chromium plated steel panels above underwent 135 hours of CASS testing. Both had identical undercoats of 0.3 mil of copper and 1.0 mil of nickel. Yet one rusted, the other did not. Why? Because the left panel had only 10 millionths of an inch ordinary chromium plate . . . while right panel had 50 millionths M&T "Duplex Chromium."

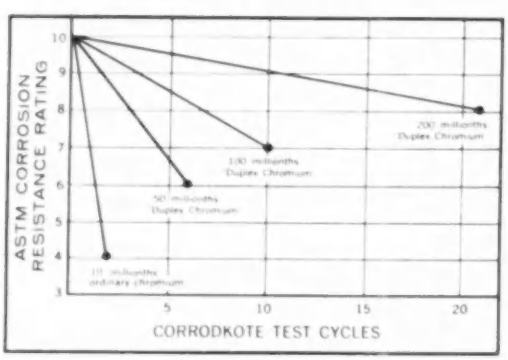
Graph below indicates how corrosion resistance increases with chromium plate thickness. The thicker the chromium, the more CASS test hours it can take.





Same thing happens with zinc die cast panels in 4 cycles of Corrodkote testing. One corrodes badly compared to the other. Why? Same reason. Both panels had identical undercoats, but left one had only 10 millionths of an inch ordinary chromium, while the right one had 50 millionths of M&T "Duplex Chromium."

Graph below shows that in Corrodkote testing, too, the thicker the chromium, the longer will it keep its appearance near the perfect mark of 10 on the ASTM durability scale.



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- PREVENTS SEAL LIP DAMAGE AT ASSEMBLY
- REDUCES ASSEMBLY AND REPLACEMENT COSTS

UNIQUE DESIGN The C/R SCOTSEAL is designed and constructed to seal within itself. In effect it is a self-contained oil sealing cartridge. This sealing cartridge consists of two parts which have relative motion to each other. In the illustration above, the outer Unit (A) is an encasing member. A portion of the inner surface of this shell serves as the surface against which the sealing member runs. The inner unit (B) is the metal reinforced, bonded synthetic rubber sealing member. In the external design, illustrated, the sealing member pushfits over the shaft and becomes a part of it—actually moving *with* it—and the metal case or shell pressfits into the housing bore. On internal designs, the sealing surface pushfits on the shaft and the sealing member is contained in the shell which pressfits in the bore.

PRE-LUBRICATED Since the sealing element is enclosed, prelubricant applied during fabrication stays in place and lubrication is supplied to the sealing lip through centrifugal action, giving extra protection particularly during starved conditions. Where the seal will be exposed to considerable dirt and water, a dirt lip is provided. Also, drain holes can be provided in the shell adjacent to the dirt lip. Centrifugal force will then sling dirt and water out . . . keeping the C/R SCOTSEAL as free as possible from abrasive elements.

ECONOMICAL Significant savings or cost reductions can be realized with the C/R SCOTSEAL. Where normal lip-type seals ideally require a shaft surface finish of 5 to 15 microinches and minimum hardness of Rockwell C30, no special finish or hardness is required for the SCOTSEAL. Shafts need not be specially hardened, ground and polished over the area where the seal contacts the shaft. Nor are wear sleeves shrink-fitted on the shaft required. All of these operations are eliminated when the C/R SCOTSEAL is used. The savings in machining costs alone will more than offset the slightly higher first cost of the seal. And there is no possibility of lip damage in installation. Additional dependability and quality will accrue to your assembly in the minds of the end-user. There will be no scored shafts to remove and refinish. Replacement of the SCOTSEAL, if necessary, is a quick, simple procedure. Thus, equipment downtime and maintenance costs will be reduced.

APPLICATION The C/R SCOTSEAL is currently providing increased sealing efficiency and extended service life on truck, bus and trailer axles. Its advantages indicate application wherever a high production run is involved; where oil retention is difficult; and where equipment downtime and replacement costs are critical. In broad terms, the SCOTSEAL may be used wherever an oil-tight press is possible.

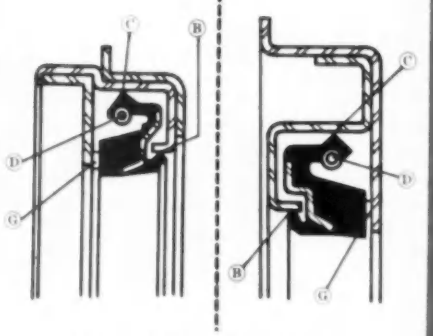
(SEE ILLUSTRATIONS ON OTHER SIDE)

* Self Contained Omnipurpose Type SEAL. Trade Mark

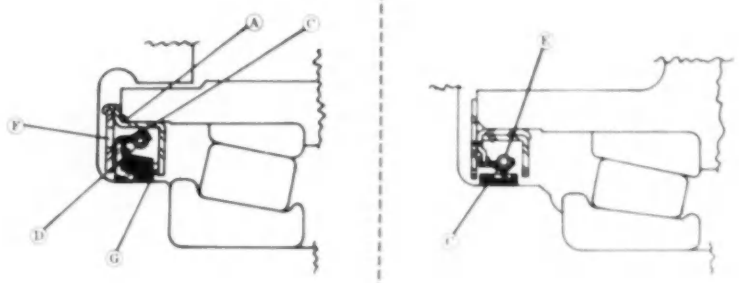
Shaft Type Scotseals...

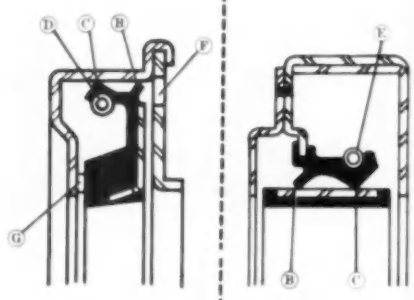
The versatility of the basic C/R SCOTSEAL concept is illustrated below. Note the many different configurations, as well as material combinations, that can be developed, all embodying the self-contained principle, but fitting ideally the requirements of various applications.

TYPICAL INSTALLATIONS...SEALING BEARINGS

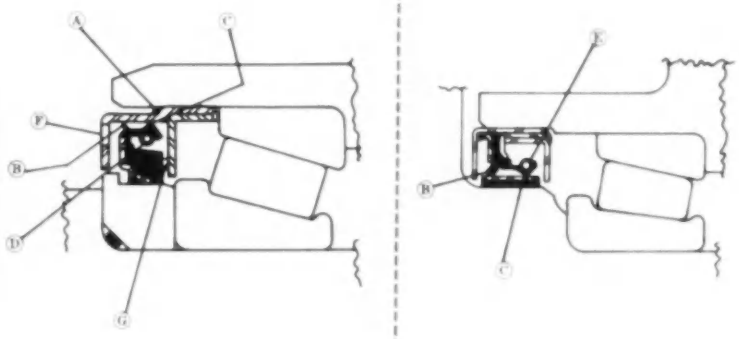


External Type SCOTSEALS





External Internal



LEGEND: **(a)** Sirvene Gasket **(b)** Dirt Lip **(c)** Sealing Lip **(d)** Expanding Spring **(e)** Contracting Spring **(f)** Drain Hole **(g)** Chaplets—keep sealing element spaced axially within its shell to insure proper installation.

Investigate this seal further. It will reduce costs for you and the ultimate user of your equipment where large production quantities are involved, and leakage, downtime and replacement are critical factors. C/R Oil Seal engineers will gladly recommend the correct C/R SCOTSEAL design for your application. Get in touch today.

CHICAGO RAWHIDE MANUFACTURING COMPANY

1301 Elston Avenue Chicago 22, Illinois

In Canada: Chicago Rawhide Mfg. Co. of Canada, Ltd., Brantford, Ontario
Export: Geon International Corp., Great Neck, New York

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News of the MACHINERY INDUSTRIES

Bookings of Machine Tools in March at $61 Million Continued Recent Monthly Rate. Timely Subjects, Including Foreign Competition, Discussed at AMTDA Meeting

By Charles A. Weinert

Machine Tool Sales Maintain Steady Pace

Preliminary operating figures from the machine tool industry for the month of March continue to show substantially the same rate as in the 2nd Half 1959. March net new orders at $61 million are about $2 million higher than the average monthly value for the 2nd Half 1959. But the 1st Quarter 1960 monthly order average is $59.3 million, compared to just about $59 million for the 2nd Half 1959.

One notable item in the March figures is that foreign orders once again, as in February, reached the sizable amount of close-to $14 million.

The break-down of net new orders in March follows: Metal-cutting type domestic orders are estimated at $36.8 million and foreign orders at $12.2 million, for a total of $49 million. Forming-type domestic orders are figured to be $10.5 million and foreign orders at $1.5 million, for a total of $12 million. The March grand total is $61 million, including $13.7 million foreign.

Final figures for the month of February 1960 are $47.7 million metal-cutting and $12.9 million forming, for a grand total of $60.6 million. In this total, foreign orders accounted for $14.1 million.

For comparison, the combined-machine net order bookings in March 1959 had a value of $51.55 million.

Shipments in March 1960 for both types of machines reached a high for the past 15 or more months, at $64.25 million preliminary. February 1960's equivalent was $51.95 million; while in March 1959 the total was $45.75 million.

In forwarding these latest statistics, Ludlow King, executive vice-president of the National Machine Tool Builders' Association, made the following observations:

"The first quarter of the year rounded out at $140.15 million (net new orders for metal-cutting type machines), or at an annual rate of $560.6 million compared to $509 million in 1959.

"Perhaps one of the most interesting developments during the past six months, which continued through March, is the improvement in export net new orders. March export orders of $12.2 million bring the first quarter up to $33.9 million, which is 24 per cent of total net new orders.

"Export orders for the past six months account for 21 per cent of the total as compared to 13.1 per cent in 1959, 17.2 per cent in 1958, 11.1 per cent in 1957, 10.3 per cent in 1956, and 8.7 per cent in 1955.

"Many feel this export business proves the USA machine tool builders are still out-designing and out-building foreign builders in the field of special-purpose machine tools. However, with the vast differences in wages, few expect to maintain this per cent or dollar volume of export business.

"With new orders varying less than $7 million during the last seven months, the cutting-type machine tool business is showing signs of acquiring more stability, but at a level well below that required to maintain our present productive capacity.

"Metal forming type machine tool net new orders totaled $12 million in March to bring the first quarter to $37.9 million. This is at an annual rate of $151.6 million as compared to $149.95 million for 1959."

ASTME Engineering Conference and Tool Show

ATTENDANCE at the 1960 ASTME Engineering Conference and Tool Show exceeded pre-show expectations. It totaled some 40,000 visitors—indicating vital interest in the overall theme of the occasion, "Tooling for Productivity."

As will be recalled, the overall program consisted of four separate, but associated, major sectors. One of these was the Tool Show itself. Another, the technical conferences. The third, plant tours to local manufacturing facilities, most of which were automotive. And fourth, the 28th Annual Meeting of the American Society of Tool and Manufacturing Engineers.

The Tool Show was heavily attended, and naturally so because of the wide display of production equipment, components and materials. In all, there were 560 exhibits in which an estimated 6000 products, valued at $15 million, were shown and demonstrated. The Show was held in Detroit Artillery Armory during the period April 21-28.

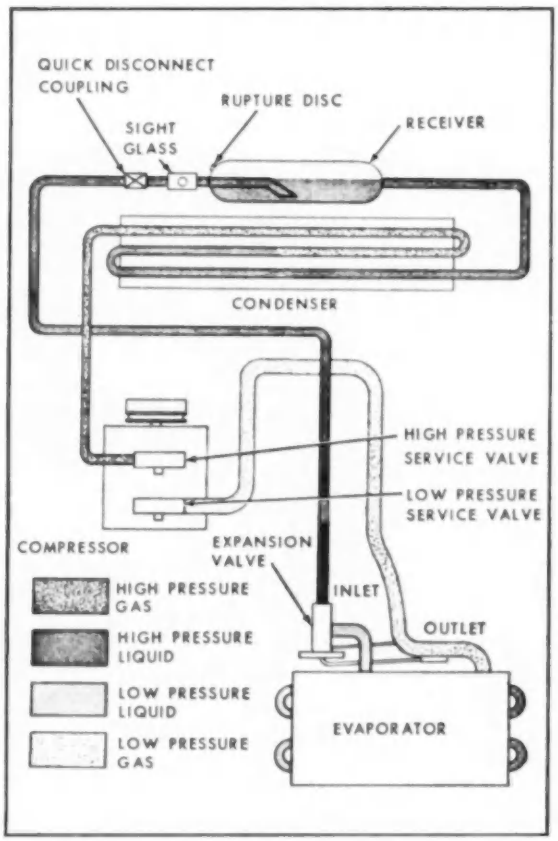
The technical sessions, scheduled concurrently with the Tool Show, took place at the Sheraton-

(*Turn to page 94, please*)

← Circle 141 on Inquiry Card for more data

Automotive Air Conditioner Sales

May Double this Year



Schematic of typical air conditioning system

By Norman M. Lloyd
MARKETS EDITOR

THE MARKET Climates to order in cars and trucks will be big business this year. Paced by an unprecedented demand, the sale of automotive air conditioners is expected to be up almost 100 per cent over last year. This walloping increase is based on estimates by equipment manufacturers and the vehicle producers who pushed total sales to over 580,720 units in 1959.

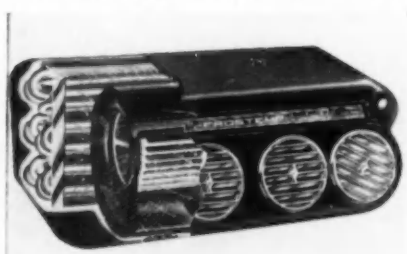
Although cost still remains the key to a mass market, automobile manufacturers boosted sales 75.4 per cent over '58 levels, with the independent air conditioner producers moving sales up 10.5 per cent.

Year	Total Unit Sales	Year	Total Unit Sales
1953	40,600	1957	405,404
1954	90,000	1958	383,867
1955	176,000	1959	580,721
1956	285,110		

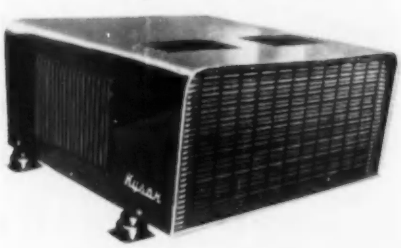
One of the most conspicuous trends reflected in this market is the significant increase of installations in medium and low priced cars. Ford and Chevrolet have shown the greatest volume increases in '59, while Pontiac and American Motors have had phenomenal increases, percentagewise.

Installation can be made on new cars at the factory, purchased from the automobile dealer, or supplied by any number of independent dealers and distributors as an "after-the-sale" item. In 1959, approximately

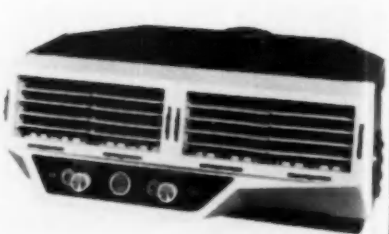
Lindustries "Frostemp" has squirrel cage type blowers mounted in front of evaporator coil, concealed underside outlets and new bonded, all aluminum condenser.



Truck cab unit produced by Kysor Heater Co. houses all components, except the compressor, in a clean package on the cab roof. Roof weight is 80 lb.



Adjustable rattle-proof louvers and additional side outlets on Eaton's air conditioner provide uniform cooling.



80 per cent of the new car sales were made at the factory with their dealers making a total of 85,600 installations. Coupled with 157,627 units sold by the independents, the figures reveal that approximately 60 per cent of all installations were made at the factory.

Six independents reported that of 78,950 units installed last year, 8962 went into other than standard size passenger cars.

Compacts	7,180	Buses	75
Imported Cars	1,125	Farm machinery	200
Special purpose	100	Boats	5
Trucks	277		

Although the sales pattern, as might be expected, is defined geographically with the greatest number of buyers in the Southwest, the per cent increase in sales is not reflected on a regional basis. Ford says that 62 per cent of its air conditioner sales originate in the Dallas, Houston, Memphis, New Orleans, Tulsa and Oklahoma City areas.

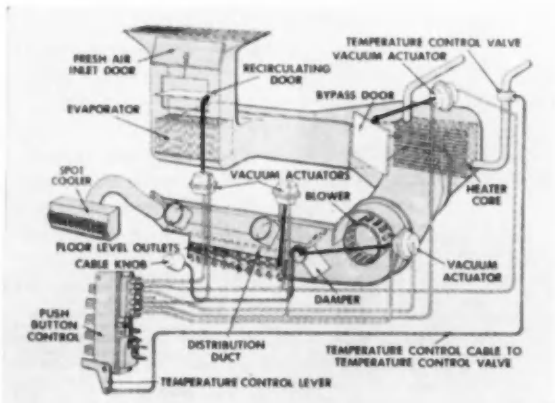
E. M. Barden, General Sales Manager for Chrysler and Imperial, expects that air conditioning installations will more than double in the next three years. He has reported that the total sales of both divisions have jumped from 8.7 per cent in 1957 to 16.7 per cent at the end of January this year. During the same period, Imperial installations have increased from 29.9 per cent to 43.6 per cent.

Other divisions of the Chrysler Corporation report the following anticipated per cent increase in factory installations:

1959		1960	
Plymouth	2.3	Plymouth	4.0
Dodge	4.4	Dodge Dart	3.9
DeSoto	7.5	Dodge	6.2
		Desoto	12.0

The Ford Division of Ford Motor expects to write up an additional 16,500 orders. Buick's factory installations are already up 5 per cent and Pontiac is estimating 42,000 units to be sold this year. The independent equipment producers, in reports to the

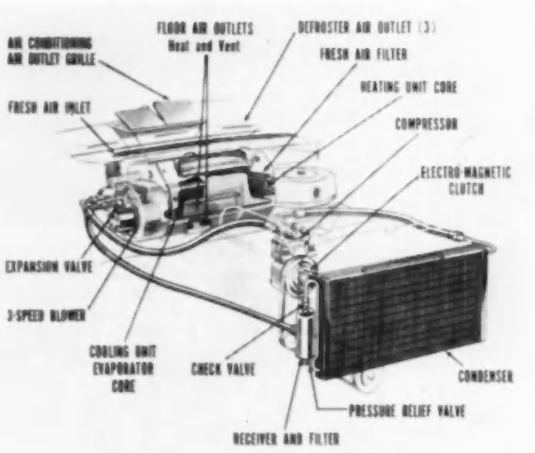
(*Turn to page* 102 *please*)



Air flow layout of Chrysler Corporation's reheat system. Heat is added to the evaporator discharge air by means of a liquid-to-air heat exchanger downstream of evaporator

AUTOMOBILE AIR CONDITIONER SALES
by Region, 1958, 1959

Region	1958 % Total Sales	1958 Unit Sales	1959 % Total Sales	1959 Unit Sales
Southwest	54.1	207,672	49.8	287,576
Southeast	18.7	71,783	19.6	113,182
Midwest	12.8	49,135	12.1	69,873
West	10.2	39,154	14.9	86,041
Northeast	4.2	16,123	3.6	20,789
TOTALS	100.0	383,867	100.0	577,461
Export	—	—	—	3,260



American Motors system has been reduced in weight by 19 lb due to a new aluminum compressor.

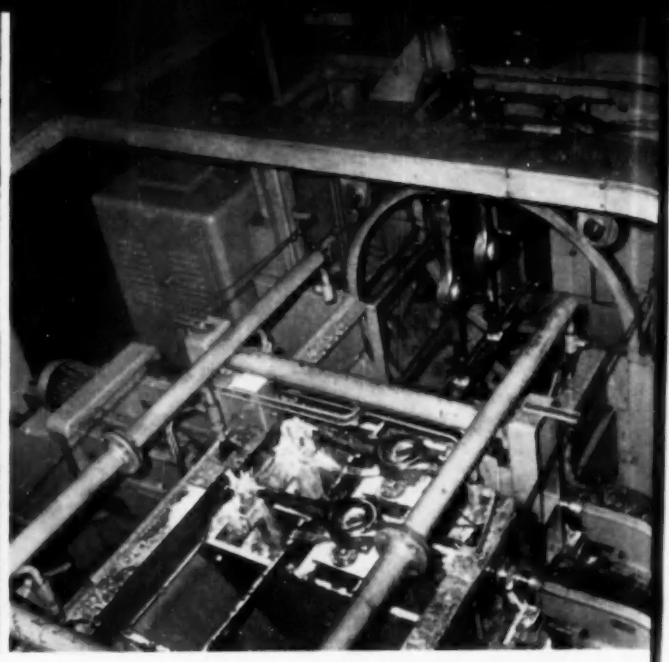
Estimated
AIR CONDITIONER SALES

Auto Manufacturers	1957	1958	1959
General Motors			
Buick	35,000	29,596	27,118
Cadillac	46,476	41,804	54,015
Chevrolet	38,000	40,000	79,218
Pontiac	12,380	9,000	37,279
Oldsmobile	38,933	40,093	63,100
Chrysler			
Chrysler, Imperial	19,429	11,270	13,754
De Soto	6,102	2,900	3,488
Dodge	8,674	6,100	6,833
Plymouth	10,415	7,700	9,770
Ford Motor			
Ford	17,000	26,984	78,491
L - M	24,213	19,346	35,000
American Motors	6,301	6,237	14,358
Studebaker-Packard	171	181	672
	263,074	241,211	423,094
Independent Manufacturers			
A R A Mfg. Co.	15,100	23,591	24,700
Clardy Auto A C Co.	6,800	6,500	8,700
Climatic Air Sales	2,000	3,500	6,000
Eaton Mfg. Co.	na	na	2,850
Frigicar Corp.	22,100	21,652	30,066
Parkomat Sales Co.	7,850	7,500	8,000
Sears, Roebuck & Co.	3,500	5,000	8,600
*J. E. Mitchell Co. Forston Co., International Auto Air Cond. Co., Kauffman Air Cond. Co.	22,900	28,483	54,361
**Others	62,080	48,430	17,350
	142,330	142,656	157,627
GRAND TOTAL	405,404	383,867	580,721

* Reported jointly by Automotive Air Conditioning Manufacturers Association.

** Auto-Temp, Capitol Refrigeration, Cartrol, Frigiquip, Kool Engineering, Lindustries, Novi Sales, Mobil Air Mfg.

Pairs of axle housings, fully machined in a Burr 12-station transfer line, are initially loaded vertically into simple carriers on the transfer bars. At each of the first four work stations they are thrust into clamping fixtures on the left side of the line, after which the tools feed in from the right to face, bore, drill and tap the exposed banjo rings.



Axle housings leaving the first section of the Burr line are rotated from vertical to horizontal by a rollover fixture. They are brought to the second section by the retracted transfer bars that lift them from their offset guide channels, then advance them to the stationary fixtures where they are located and clamped on the ID of the open ring face and the machined OD's of the hub ends.

Simca Boosts Car Output with Advanced Machining Lines

PART I

By David Scott
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

SIMCA is the fastest-growing manufacturer in the booming French automobile industry, which last year topped the million mark for the first time, showing a 14 per cent gain over 1958. Ranking a close third behind Renault and Citroen, Simca turned out 235,000 cars in 1959, or nearly a fifth of the French passenger car total. Output was quadrupled between 1952 and 1958, and today the annual rate is more than twice the 1954 level.

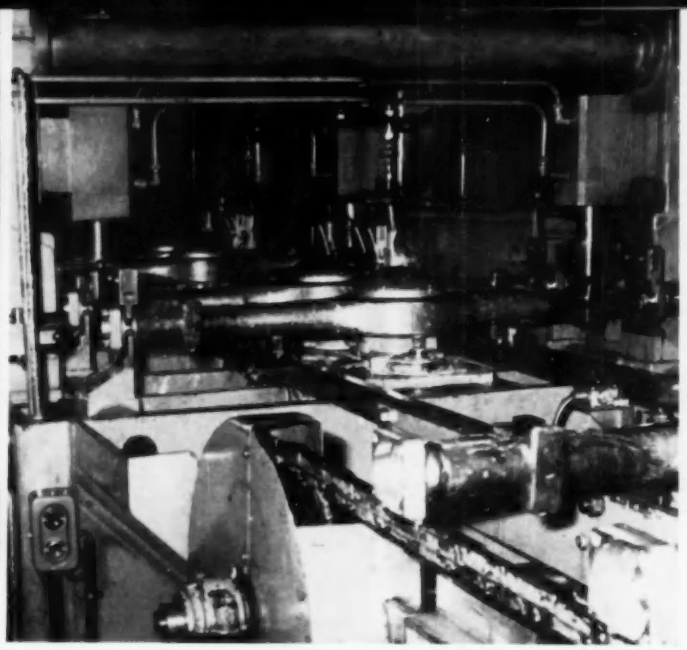
Of Franco-Italian origin and with American connections since the war, Simca was founded in 1934 by the present Managing Director, H. T. Pigozzi, who bought the Nanterre factory near Paris to assemble Fiat cars for which he was then import agent. The first all-French Simca was made there in 1936, but yearly production had never exceeded 20,000 when manufacture ceased during the war.

Activity was resumed in 1946 and the forerunner of the present four-cylinder Aronde introduced in 1951, with output increasing slowly until 1954. In that year Simca bought an 85 per cent interest in French Ford — established since 1935—and took over its Poissy plant making the V8-engined Vedette. Production of both models climbed rapidly after that, and in November 1955 the company started a major expansion and modernization program at Poissy.

The existing factory was enlarged over seven-fold, from 970,000 sq ft to seven million sq ft, boosting capacity to more than 1000 cars a day. By working round the clock this ambitious project was completed by spring 1958, a record time of 30 months. Another milestone for Simca came the same year when Chrysler bought Ford's holdings plus additional shares to give it a 25 per cent interest in the company.

The link-up with Chrysler, concerned with world-wide sales and distribution, was of outstanding advantage to Simca, for it opened up outlets in the United States through Chrysler's 9000 dealers there. As a result, exports to America rose by 45 per cent to 43,000

Second section of the Burr line for axle housings where both hub ends are faced, drilled, bored and counterbored in seven double stations.



At the end of the transfer line bearing seats are checked with air gages after the hub ends are accurately located and clamped in V-blocks.

OPERATIONS ON AXLE HOUSINGS

cars in 1959, the first full year of the partnership. At the same time, total exports (about half of production) increased by 60 per cent, with Canada and Australia among the other leading markets.

Meanwhile, American influence has emerged on the sales-appeal side. Simca is one of the few European auto manufacturers to follow the Detroit example of variations on a theme. Matching market penetration with economy of production, it is ringing the changes on three basic engines and two body shells for a range of no fewer than 23 catalog models.

The P.60 Aronde was introduced in September 1958 as a "personalized" car offered in a wide variety of body style and trim combinations in addition to a profusion of paint and upholstery options. Four-cylinder engines used are a 66.49-cu in. unit rated at 42 hp, and the 78.69-cu in. 51-hp Flash that is tuned to develop 60 hp in the Flash Special.

Different forms of the larger Ariane are powered either by the Flash engine or by an ex-Ford 143.46-cu in. V8, while this 85-hp V8 is used in all versions of the top-bracket Vedette, which has a similar but slightly longer body.

Production at Poissy is concentrated on mechanical parts for all models, the body for the Aronde, and final assembly of it and the Ariane, while Nanterre turns out the four-cylinder engines and assembles the Vedette. The V8s are still produced at Poissy at the rate of some 200 a day, although the volume is diminishing because France's archaic vehicle taxation, that rises sharply with cubic displacement, limits the local demand for the larger engine. In fact, Simca is planning to shift manufacture of this power unit to one of its plants in Brazil where market potentialities are greater.

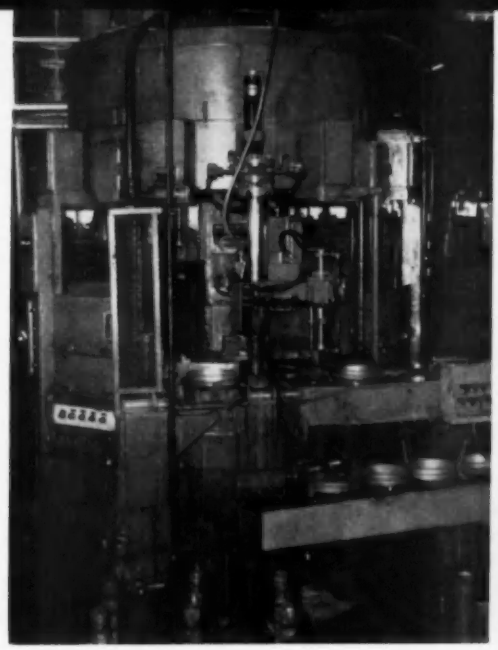
Located on the bank of the Seine 25 miles west of Paris, the Poissy factory is one of the most modern in Europe. To the original Ford building (now housing the welding lines) have been added completely new shops for machining, pressing, plating, painting, body trim and final assembly. There are also installations for water purification, power generation and heating.

The entire plant was planned as an integrated unit aimed at flow production and rational materials handling, both between major sections and along individual machine lines. Conveyors are extensively used for movement of components, and monorails are generally favored over belts or roller tracks, even between adjacent machines, in order to save floor area.

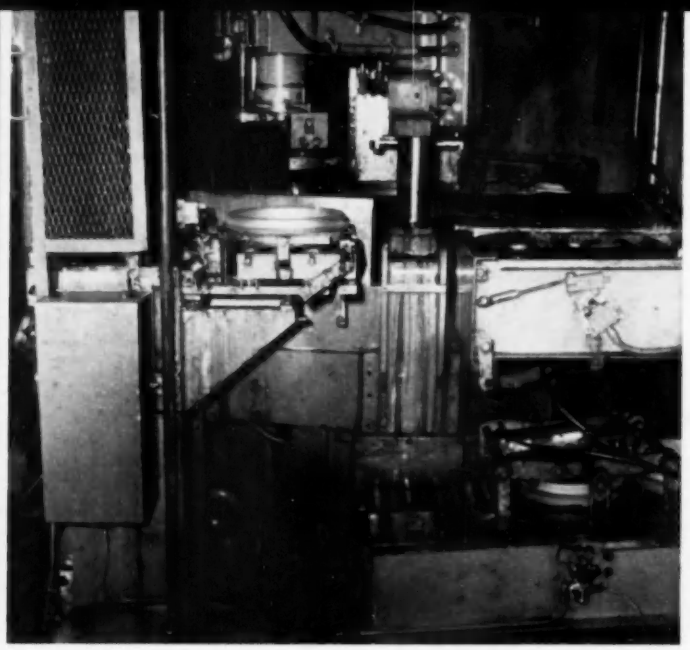
Economies in transport as well as space are effected by common conveyors, circulating around several different production lines, with baskets or fitted trays for mixed parts that are tiered for successive stages of processing. Stationary bins and pallets are employed only when other methods are impracticable, thereby minimizing the traffic of fork trucks.

Simca regards its daily output of 1000 cars as modest, and, in view of the high degree of parts mobility, insufficient to justify full automation except in special cases. One of these is the welded-up rear axle housing, which requires a variety of operations and accurate machining of the banjo ring face and hub ends.

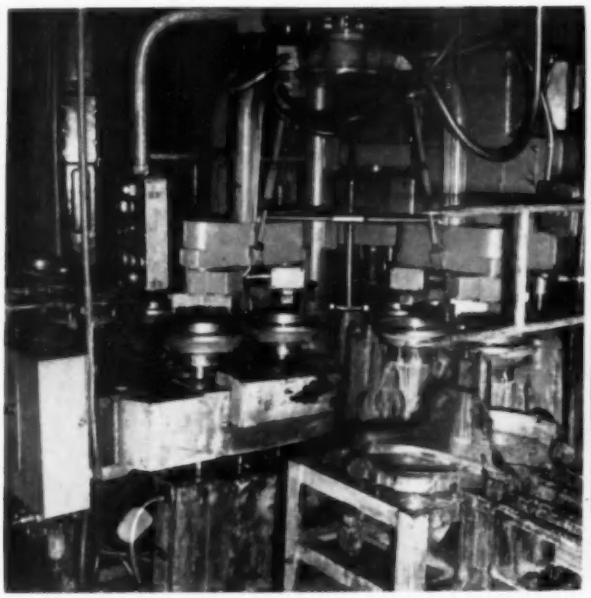
These parts are fully machined in pairs on a Burr 12-station automatic transfer line formed in two



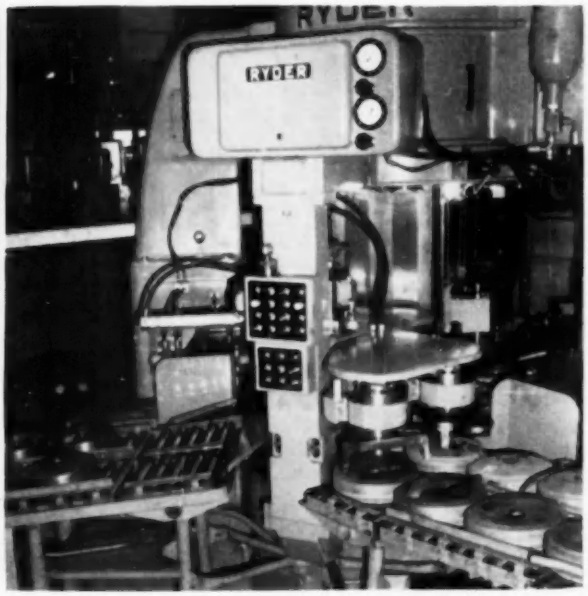
Eight-spindle Bullard at the start of the Aronde brake drum line is fed with rough castings from an inclined roller track. These are released singly onto an elevator platform which raises them within reach of the pivoting loader on the machine. Outgoing drums are unloaded onto the upper gravity track that carries them to the G.S.P. unit for drilling and tapping.



Rim-up brake drum on the waiting elevated platform is gripped interally by the descending load arm, while the similar unload arm simultaneously drops into the finished drum in the machine. All turning operations are duplicated on a second Bullard.



Turned drums from the two Bullards are carried to the G.S.P. on parallel roller tracks terminating in lifters that present them in pairs to the overhanging loading arms. Drilled and tapped drums are unloaded by the second swiveling arm which drops them onto the pivoted plates (foreground) that tilt them vertically into the exit guide channel.



Front and rear brake drums for the Vedette and Ariane are externally turned and ribbed in pairs on this four-station Ryder. Loading and unloading is automatic, and outgoing drums are conveyed by gravity tracks to three hand-loaded Bullards for internal machining.

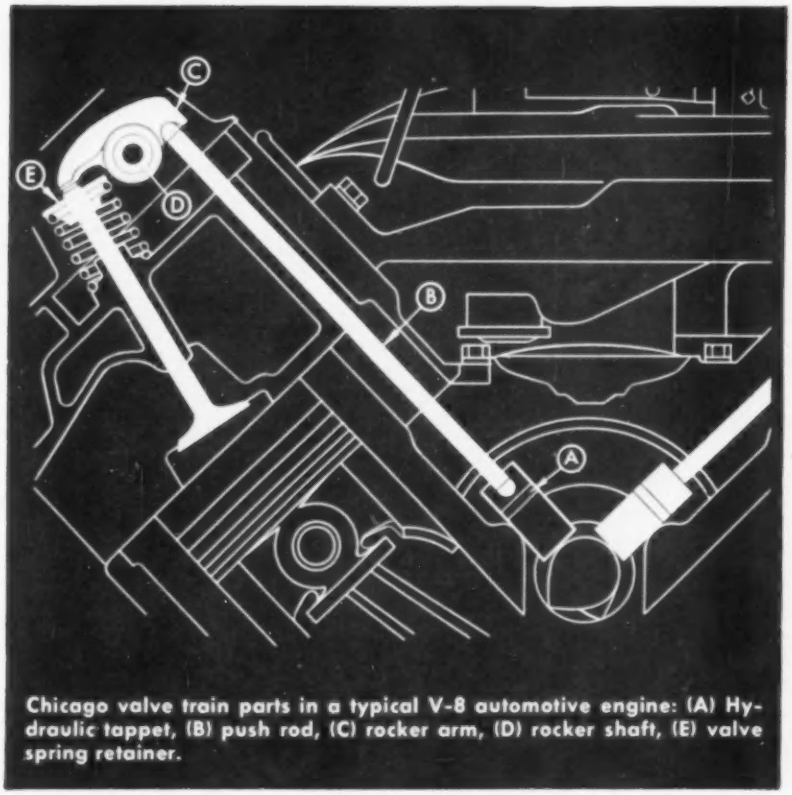
OPERATIONS ON BRAKE DRUMS

sections joined by a turnover fixture that rotates the assembly from vertical to horizontal. The line is exceptional in that there are individual fixtures at each work station, with components moved between them by a simple transfer mechanism.

At the loading position two housings are placed in the external pair of vertical carriers mounted

(*Turn to page* 150, *please*)

For all engines - - -



Chicago valve train parts in a typical V-8 automotive engine: (A) Hydraulic tappet, (B) push rod, (C) rocker arm, (D) rocker shaft, (E) valve spring retainer.

Passenger cars

Trucks

Tractors

Diesels

Aircraft

Everything you need in valve gear

from CHICAGO

Here at Chicago you'll find a single source for everything you need in valve gear. These specialized facilities are solving problems and saving money for leading engine manufacturers . . . and can do the same for you.

Design and Engineering—at Chicago you'll find valve gear engineering experience in depth . . . men who understand your problems and will work with your engineering staff in designing cam shafts and complete valve gear assemblies for any type of engine.

Manufacturing—Chicago is a leading manufacturer of valve train parts. Our complete line includes precision-made hydraulic and mechanical tappets; push rods in both lightweight tubular and solid styles; valve adjusting screws including new self-locking screws that cut assembly costs; valve spring retainers; rocker arms and rocker shafts.

Testing—we have complete laboratory and engine testing facilities.

For the full story of how we can serve you, write our Tappet Division.

THE CHICAGO SCREW COMPANY

ESTABLISHED 1872 • DIVISION OF STANDARD SCREW COMPANY

2701 WASHINGTON BOULEVARD, BELLWOOD, ILLINOIS

Circle 142 on Inquiry Card for more data

• • INDUSTRY STATISTICS • •

By Marcus Ainsworth
STATISTICAL EDITOR

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Vehicle Make	Weeks Ending April 30	Weeks Ending April 23	Year to Date 1960	Year to Date 1959
PASSENGER CAR PRODUCTION				
Total—American Motors Corp.	11,525	11,309	179,594	143,036
Chrysler	1,366	1,358	33,353	28,394
De Soto	271	252	13,726	21,486
Dodge	9,877	9,874	148,041	94,558
Imperial	408		6,717	8,500
Plymouth	4,818	4,653	108,139	157,907
Valiant	6,707	6,174	97,618	
Total—Chrysler Corp.	23,447	22,311	407,594	280,845
Comet	2,187	5,064	34,704	17,884*
Falcon	8,808	11,174	172,801	
Ford	20,314	14,503	404,559	547,522
Lincoln	252	264	8,850	12,021
Mercury	3,105	2,948	67,455	57,921
Total—Ford Motor Co.	34,666	33,953	688,369	635,348
Buick	4,989	5,290	111,316	106,499
Cadillac	199	3,389	61,149	61,697
Chevrolet	38,513	40,949	658,905	599,861
Corvair	5,409	5,764	113,245	
Oldsmobile	6,960	8,052	148,567	153,351
Pontiac	9,166	11,190	171,211	158,194
Total—General Motors Corp.	65,236	74,634	1,264,393	1,079,602
Total—Studebaker-Packard Corp.	2,424	2,861	45,040	65,548
Checker Cab	198	168	2,550	1,948
Total—Passenger Cars	137,496	145,036	2,587,540	2,206,327
TRUCK AND BUS PRODUCTION				
Chevrolet	8,564	8,749	172,706	140,858
G. M. C.	2,320	1,963	40,869	31,313
Diamond T	60	66	1,049	2,331
Divco	100	100	1,532	1,284
Dodge and Fargo	1,582	1,317	29,087	30,268
Ford	7,552	7,183	134,587	115,250
F. W. D.	15	18	399	332
International	2,638	2,516	47,714	48,249
Mack	364	341	4,920	6,005
Studebaker	570	503	5,219	5,222
White	411	421	6,696	6,595
Willys	3,417	2,859	46,394	40,302
Other trucks	95	95	1,420	1,323
Total—Trucks	27,688	26,131	492,592	429,332
Buses	115	75	1,335	848
Total—Motor Vehicles	165,299	171,242	3,081,467	2,636,507

* Edsel production.

1960 TRUCK TRAILER SHIPMENTS

Industry Division, Bureau of the Census

Type of Trailer	February	Two Months 1960	Two Months 1959
Vans			
Insulated and refrigerated	473	1,120	809
Steel	118	171	73
Aluminum	355	949	736
Furniture	180	316	184
Steel	169	291	146
Aluminum	11	25	38
All other closed-top	2,927	5,724	4,200
Steel	485	1,144	1,182
Aluminum	2,442	4,580	3,018
Open-top	287	601	323
Steel	135	194	139
Aluminum	152	407	184
Total—Vans	3,867	7,761	5,516
Tanks			
Non- and low-pressure			
Petroleum and aircraft refueliers			
Carbon and alloy steel	140	301	394
Stainless steel	21	42	41
Aluminum	184	337	242
Total—Petroleum	345	680	677
Chemical, food, and sanitary	68	116	66
Dry materials	119	172	159
High-pressure LPG, chemicals, etc.	24	56	85
Total—Tanks	556	1,024	987
Pole, pipe, and logging			
Single axle	10	44	55
Tandem axle	69	138	98
Total	79	182	153
Platforms			
Racks, livestock, and stake	26	49	76
Grain bodies	134	297	257
Flats, all types	941	1,702	1,422
Total—Platforms	1,101	2,048	1,755
Low-bed heavy haulers	156	304	352
Dump trailers	114	208	303
All other trailers	304	582	474
Total—Complete Trailers	6,177	12,109	9,540
Dump trailer chassis[1]	91	172	
Trailer chassis only[1]	238	464	765
Total—Trailers and Chassis	6,506	12,745	10,305
Detachable van bodies[1]	148	429	

[1] Sold separately.

NEW PASSENGER CAR REGISTRATIONS BY REGIONS

Zone	Region	February 1960	January 1960	February 1959	Two Months 1960	Two Months 1959	Per Cent Change Feb. over January	Feb. over Feb. 1959	Two Months 1960 over 1959
1	New England	25,172	20,278	14,985	45,450	32,647	+24.13	+67.96	+39.22
2	Middle Atlantic	96,218	72,707	70,204	168,925	143,445	+32.34	+37.05	+17.76
3	South Atlantic	64,221	65,882	56,909	130,103	119,652	− 2.52	+12.85	+ 8.73
4	East North Central	121,781	114,445	109,030	236,226	202,479	+ 6.41	+11.69	+16.67
5	East South Central	25,333	18,811	20,073	44,144	39,738	+34.67	+26.20	+11.09
6	West North Central	40,335	32,589	37,618	72,924	76,505	+23.77	+ 6.68	− 4.68
7	West South Central	41,293	36,065	42,549	77,358	81,410	+14.50	− 2.95	− 4.98
8	Mountain	15,826	15,852	16,869	31,678	33,270	− 0.16	− 6.18	− 4.79
9	Pacific	63,999	53,487	56,658	117,486	116,700	+19.65	+12.96	+ 0.67
	Total—United States	494,178	430,116	425,095	924,294	845,846	+14.89	+16.25	+ 9.27

States comprising the various regions are: Zone 1—Conn., Me., Mass., N. H., R. I., Vt. Zone 2—N. J., N. Y., Pa. Zone 3—Del., D. of C., Fla., Ga., Md., N. C., S. C., Va., W. Va. Zone 4—Ill., Ind., Mich., Ohio, Wis. Zone 5—Ala., Ky., Miss., Tenn. Zone 6—Iowa, Kan., Minn., Mo., Neb., N. D., S. D. Zone 7—Ark., La., Okla., Tex. Zone 8—Ariz., Colo., Ida., Mont., Nev., N. M., Utah, Wyo. Zone 9—Alas., Cal., H. I., Ore., Wash.

1960 TRUCK FACTORY SALES BY G.V.W.

As reported by the Automobile Manufacturers Association

Period	6,000 lb. and less	6,001-10,000 lb.	10,001-14,000 lb.	14,001-16,000 lb.	16,001-19,500 lb.	19,501-26,000 lb.	26,001-33,000 lb.	Over 33,000 lb.	Total
January	62,211	17,920	1,260	3,080	18,877	5,962	3,148	2,810	115,268
February	70,245	18,969	1,222	2,985	18,348	7,023	3,596	3,530	125,938
March	73,143	19,849	1,265	3,240	18,065	7,849	4,061	3,697	131,169
3 Months—1960	205,599	56,758	3,747	9,305	55,290	20,834	10,805	10,037	372,375
3 Months—1959	155,406	51,094	3,915	25,857	35,133	15,806	10,358	9,801	307,372

PREVIEW of the DESIGN ENGINEERING SHOW

THE rate of modern industrial progress is dependent upon the continued success of America's Design Engineer in overcoming the intricate problems connected with product research and development. To aid Design Engineers in maintaining the current rate of advance in industrial technology, the American Society of Mechanical Engineers (ASME) is, once again, sponsoring the annual Design Engineering Show, May 23-26.

Running concurrently with the Exposition will be a series of technical seminars and conferences. The show will be held in the New York Coliseum and will feature over 15,000 products and component parts. These items will be displayed by over 560 companies and will be in the following categories: Mechanical components, 105 companies; electrical and electronic components, 94; power transmissions will be shown by 65 companies; there will be 61 showing metals; 55 with non-metallic materials; 53, shapes and forms; 49, fasteners and adhesives; finishes and coatings will be featured by 23; and engineering services and equipment will be in 62 company booths.

More than 20,000 visitors are expected to attend the show, and investigate the products that will be displayed. Of interest to all design personnel, who come from all parts of the country, will be the technical sessions. The opening session, "New Horizons in Engineering Design," will feature design authorities from both the field of space technology and nuclear science. The machine design division of the ASME will conduct a four-day conference, concurrently with the show. This year's papers will concern themselves with the application of space-age design theory and techniques, to new consumer products. Advances made in power, controls, materials, computers, components and mechanics will be considered..

All technical sessions will take place on the mornings of May 23-26, permitting attendees to evaluate exhibitors' products, displayed each afternoon. Since everyone is interested in seeing what the products of tomorrow will look like, the Design Engineering Show is the best place to get first-hand information on these products and how they will be developed.

On the following four pages are brief descriptions of some of the developments that will be displayed at the show.

Complete Conference Program

Monday, May 23
NEW HORIZONS IN ENGINEERING DESIGN

Co-Chairmen—Dr. Hugh L. Dryden, Deputy Administrator, National Aeronautics and Space Administration, Washington, D. C.; Dr. Arthur R. Kantrowitz, Director, Avco-Everett Research Laboratory, a Div. of Avco Corp., Everett, Mass.

Panel Members: William R. Gall, Chief of Design Section, Reactor Experimental Engineering Division, Oak Ridge National Laboratory, Oak Ridge, Tenn.; Varick D. Schwartz, Assistant Project Manager, Army Boiling Water Reactor Project, Combustion Engineering, Inc., Windsor, Conn.; George P. Sutton, Chief Scientist, Advanced Research Projects Agency, Department of Defense, Washington, D. C.; Elmer P. Wheaton, Vice President-Engineering, Missiles and Space Systems, Douglas Aircraft Company, Inc., Santa Monica, Calif.

Tuesday, May 24
Concurrent Sessions
RELIABILITY

Co-Chairmen—Frank McGinnis, Director, Reliability and Quality Control, Sperry Gyroscope Co., A Div. of Sperry Rand, Great Neck, N. Y.; Nicholas Osifchin, Military Development Engineer, Bell Telephone Laboratories, Inc., Whippany, N. J.

"Reliability Prediction—Its Validity and Application as a Design Tool"

Speaker—Thomas C. Reeves, Director of Products Assurance, RCA Defense Electronic Products Div., N. Y.

"Impact of Reliability on Design"

Speaker—Harry R. Powell, Member of Senior Staff, Space Technology Laboratories, Los Angeles, Calif.

Tuesday, May 24
FABRICATION

Co-Chairmen—Hemenway R. Bullock, Senior Engineer, Metallurgical Laboratory, Government Equipment Div., Raytheon Co., Maynard, Mass.; John Alico, Manager, New York Office, Day and Zimmermann, New York, N. Y.

"New Welding Processes"

Speaker—John J. Chyle, Director of Welding Research, A. O. Smith Corp., Milwaukee, Wis.

"Metal Fabrication by Explosives"

Speaker—Vasil Philipchuk, Manager, Special Projects Department, National Northern Div., American Potash & Chemical Corp., West Hanover, Mass.

Tuesday, May 24
HYDRAULICS

Co-Chairmen—Edward M. Greer, Chairman, Greer Hydraulics, Inc., New York International Airport, Jamaica, N. Y.; John A. Farris, Manager, Engineering Liaison, Aircraft Porous Media, Inc., Pall Corp., Glen Cove, N. Y.

"Current Status of Hydraulic Pumps and Some Trends"

Speaker—Edward Brown, Director of Engineering, Machinery Hydraulic Div., Vickers, Inc., Detroit, Mich.

"Hydraulic Fluids—Today and Tomorrow"

Speaker—Richard L. Leslie, Supervisor, Fluids and Chemistry Group, Research and Development Department, Vickers, Inc., Detroit, Mich.

Wednesday, May 25
CONTROL SYSTEMS

Co-Chairmen—Dr. E. L. Harder, Director, Analytical Department, Westinghouse Electric Corp., East Pittsburgh, Pa.; John T. Lynch, Manager, Electronic Department, Burroughs Corp., Paoli, Pa.

"Analysis of Control Systems by Analog Computers"

Speaker—William E. Sollecito, Systems Analysis Engineer, General Engineering Laboratory, General Electric Co., Schenectady, N. Y.

"Computers in Control Systems"

Speaker—Dr. Arthur S. Robinson, Assistant Chief Engineer for Advanced Electronic Research & Development, Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.

Wednesday, May 25
MATERIALS

Co-Chairmen—Albert R. Mead, Staff Engineer, Manufacturing Engineering Department, Grumman Aircraft Engineering Corp., Bethpage, N. Y.; Edward N. Hegge, Deputy Director, Watertown Arsenal Laboratories, U. S. Army Ordance Arsenal, Watertown, Mass.

"Some Considerations in the Use of High Strength Steels"

Speaker—A. M. Hall, Division Chief, Battelle Memorial Institute, Columbus, Ohio.

"Increasing the Performance of Nonmetallic Structural Materials"

Speaker—W. E. Dirkes, Chief, Plastics Branch, Materials Laboratory, Wright Air Development Center, Wright-Patterson Field, Ohio.

(*Turn to page* 110, *please*)

What's NEW at the DESIGN ENGINEERING SHOW

New York Coliseum — MAY 23-26

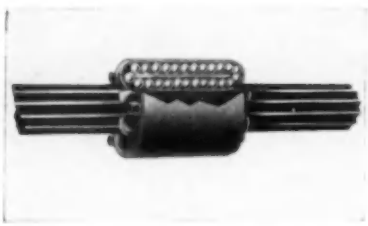
Steering Gear Spline

Introduction for the first time of an "on the shelf" line of standardized ball bearing splines has been announced by the Saginaw Steering Gear Div of General Motors Corp.

The new spline will be featured in the Saginaw Steering Gear ball bearing screw and spline exhibit at the Design Engineering Show.

Production of the relatively low-priced, standardized models was made possible through extensive re-tooling during the last year, SSG officials pointed out. They are produced in six sizes, ranging from ⅜ to 3-in.

Use of the Saginaw ball bearing spline assembly is indicated in applications requiring low resistance to linear motion, long trouble-free service life and minimum radial lash. To this end, the Saginaw design employs a gothic arch race configuration. The use of this groove form



produces an end product with a consistently high degree of uniformity and allows, when necessary, the preloading of the inner to the outer member.

The Saginaw ball bearing spline can be fitted with integral gears or sprockets, clutching devices, trunnions, flanges, and bearings.

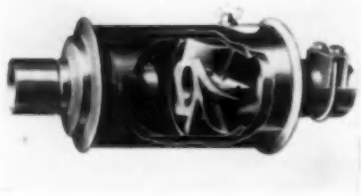
Booth 1508

Circle 70 on postcard for more data

Exhaust Spark Arrestor

This new compact spark arrestor offers complete protection against the hazards of incandescent carbon particles in the exhaust of internal combustion engines. Designed for outstanding reliability and long service life, the spark arrestor may be applied to either mobile or stationary engines from 150 to 1200 cu in. displacement.

The vane type arrestor employs centrifugal action to trap particles of hot carbon. As the exhaust flows through the unit a spinning action is



imparted by a stationary vane in the exhaust stream. The rotary motion drives the heavy particles to the outside and into the trap. The Air-Maze Corporation will exhibit this product and other items of their line at the show. *Booth 1134*

Circle 71 on postcard for more data

Lightweight Crankshaft

A crankshaft, that has been completely cored out to reduce the weight by approximately 40 pct, will be displayed by the Ductile Iron Division of the International Nickel Company. The main theme of their exhibit will be ductile iron castings made to close dimensional tolerances. Another interesting item, that will be featured

by Ductile, is the fracturing of metal on view under a microscope. The action under the microscope will be projected on a television screen.

Booth 1815

Circle 72 on postcard for more data

FOR ADDITIONAL INFORMATION please use reply card at back of issue

New Actuating Controls

A complete new line of actuating controls for operating small engines, air conditioning equipment and valves on automobiles, trucks, material handling equipment, farm and transportation equipment, will be displayed at the design show. These controls are adaptable to any mounting on shaft, bulkhead or channel and are available in any length. The Weatherhead Company will feature this line in *Booth 1601.*

Circle 73 on postcard for more data

New Thermostat

A new industrial thermostat, designated model M-1C, will be shown at the exhibit in New York. This unit has been designed for applications

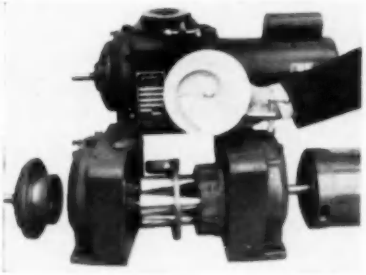
where space is at a premium. It has an electrical rating of 5 amp, 125-250 V, AC; 3 amp, 30 V, DC. This device operates on the differential expansion of solids, and employing a snap-action miniature switch, is suitable for either on-off control or as a high temperature alarm. Burling Instrument Co.

Booth 2100

Circle 74 on postcard for more data

Speed Control

Graham Transmissions Incorporated will introduce for the first time a new type of control that provides equal changes in speed for equal increments of control adjustment is announced by Graham Transmissions Inc. for its line of infinitely variable



speed transmissions. The new cam control is shown above the major sub-assemblies of the transmission with an assembled transmission in the background. This new control, while providing linearity, also insures high accuracy setting and holding of speed over a range from any desired maximum to zero—plus reverse if desired.

Booth 835

Circle 75 on postcard for more data

4 Post Drafting Table

A major styling change is the big feature in a four post drafting table

that will be shown by the Hamilton Manufacturing Co. Designated series CL 100, the new table has modern canted leg design.

Booth 1615

Circle 76 on postcard for more data

Glass Pillows

Tiny pillows and balls of glass are now being produced as a low-cost material for filler, packing, filtering and tumbling applications.

Corning Glass Works is mass producing the pieces for varied industrial processing and commercial uses. The pillows include both solid and hollow pieces. They are being made in lengths up to one-half inch. The balls can be made to diameters of one-half inch.

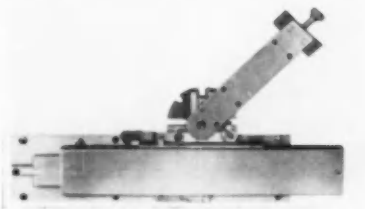
Corning will display the pieces at the Design Engineering Show.

Booth 1507

Circle 77 on postcard for more data

Lock and Chassis Slide

A positive lock slide has been designed to prevent locks from releasing from the strain of shock and vibration testing. These new chassis slides are guaranteed not to open unless manually operated. These units are fabricated from high tensile, heat



treated, anodized aluminum with ball spacers, ball bearings and stop pins of passivated stainless steel.

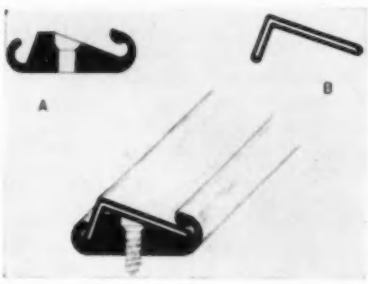
The weight capacity of this line ranges from 50 to 500 lb per pair and can be provided in lengths from 10 to 68 in. Grand Sliding Mechanisms will show these devices at the show.

Booth 312

Circle 78 on postcard for more data

Two-Part Trim Molding

Taking advantage of the resiliency of buryrate a new two-part trim moulding has been designed with an interlocking feature that prevents the fasteners from being seen. The base



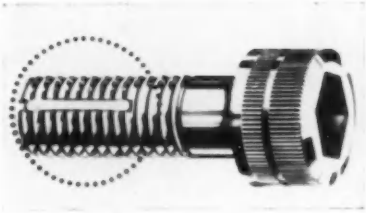
moulding is applied to the surface that is to be trimmed and then the outer portion is popped into slots provided in the base. Sections of this trim will be displayed at the show by the Anchor Plastics Company.

Booth 2103

Circle 79 on postcard for more data

Self Locking Inserts

A new line of socket screws with plastic inserts will be on display at the show. They are expected to find a wide range of applications in the assembling of automotive compo-



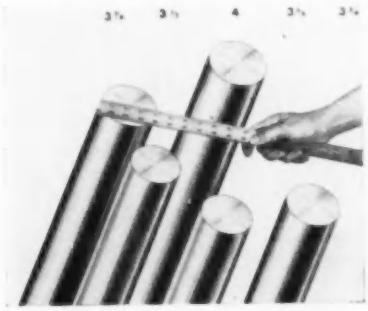
nents, and in the heavy machinery industry. The manufacturer reports this line is recommended for applications where vibration and adverse conditions are present. See the new fasteners in the booth that will be occupied by Parker-Kalon.

Booth 635

Circle 80 on postcard for more data

New Steel Bar Line

For the first time, at the design show, La Salle Steel Company will feature five new sizes in its Stress-



proof bar line. The new bars will be available in diameters of: 3½, 3⅝, 3¾, 3⅞ and 4 in. Also displayed will be various parts made from both Stressproof and Fatigue-Proof barstock. These parts will represent current applications by customers. A new engineering bulletin will be offered for the first time at the show. *Booth 1321*

Circle 81 on postcard for more data

What's NEW at the DESIGN ENGINEERING SHOW

New York Coliseum MAY 23-26

Piston Wear Rings

Glass filled nylon is now being used to fabricate piston wear rings for use in heavy hydraulic applications such as in tractors or in off-the-road equipment. The new wear rings are a product of The Garlock Packing Company, and are available in a wide range of standard sizes.

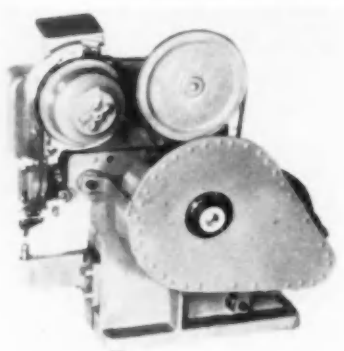
The filled nylon offers many advantages to manufacturers of new equipment as well as to replacement suppliers. The material has excellent wear resistance and in itself requires no lubrication. It has a wide temperature range, remaining serviceable up to 350 deg F., and its low coefficient of friction will not gall cylinder walls even on long stroke pistons where canted reciprocation may be encountered.

Booth 2206

Circle 82 on postcard for more data

Assembly Machine

Automatic contact assembly machines that will be displayed at the show, have been designed with new head and anvil designs which permit



attachment or double heading of contacts to precision tolerances in thin contact blades without distortion. The Judson L. Thomson Manufacturing Company will show these units at the Design Engineering Show.

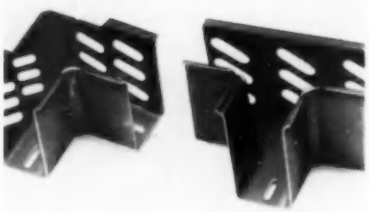
Booth 625

Circle 83 on postcard for more data

Wiring Chanel

Preformed corner and T sections for use with Panel Chanel wiring raceways will be featured by Stahlin Brothers, Inc. at the Design Engineering Show. Named Redi-Korners and Redi-Tees, the new components eliminate much of the time-consuming hand work usually entailed in constructing a network of raceways for panel wiring.

Included among the new preformed T sections being shown are Reducing Redi-Tees, so named because they



form a connection between two wiring ducts of different widths. They make it possible to assemble a network of multiple-size Panel Chanel raceways using all preformed parts.

Booth 2003

Circle 84 on postcard for more data

New Automobile Paint

A major development in automobile paint that could open an entirely new realm of metallic colors will be unveiled during the Design Engineering Show.

The futuristic color effect is displayed on a 1960 Chrysler New Yorker sedan and was developed by the Chrysler and Imperial Division of the Chrysler Corporation, and The Dobeckmun Company, a division of The Dow Chemical Company.

The unique finish is achieved through the use of a new technique which utilizes Dobeckmun's Metalflake, tiny particles of precision-cut, decorative flakes made from coated aluminum foil. A relatively new material by Dobeckmun, Metalflake adds glamour to a multiplicity of products ranging from household goods and floor coverings to wearing apparel and textiles. It has never before been used in or with paint, however.

Metalflake, is produced in a variety of shapes and sizes, varying from precision-cut particles so small they resemble grains of sand, to larger squares, geometric shapes, stars, and cut threads.

The automobile utilizes gold Metalflake in the most minute size yet achieved by Dobeckmun—rectangular shapes precision-cut to the almost-unbelievable measurements of 1/130th of an in. by 1/230 of an in. One pound of the dust-like, glittering material is composed of nearly 385-million particles.

The sparkling particles are sprayed onto the body and covered with a thick layer of lacquer. Because the Metalflake chips land in haphazard paterns, they create a luminous, three dimensional reflected effect, never before duplicated in painted surfaces. This reflection causes the paint to take on different hues and tints, depending upon the angle from which it is viewed.

Other special colors and effects can be created by the use of different combinations of Metalflake and lacquer.

Booth 2121

Circle 85 on postcard for more data

Self-Locking Fasteners

The Nylok Corp. will exhibit a line of self-locking threaded fasteners that are used in combination with auxiliary locking devices, such as safety wiring, lock washers and cotter pins.

These fasteners are used extensively in the automotive and aircraft industries where vibration or failure of a fastener could cause loss of life or serious mechanical difficulty. The locking principle has been proven in extensive tests conducted by engineers associated with the Missiles and Electronics Div. of the U. S. Government. The exhibit at the Design Engineering Show will display the product line, the principle of operation, and the productive know how. This latter factor will be proven by the operation of an automated process which inserts a pellet of DuPont nylon in a screw which is 0.050 in. in diameter.

Booth 139

Circle 86 on postcard for more data

Miniature Inserting Tool

A new miniature automated inserting tool for high speed production installation of wire thread inserts will be demonstrated at the Design Engineering Show by the Heli-Coil Corporation. Capable of driving up to 1200 inserts per hour, the new hopper feed and lightweight gun combination is designed specifically for automated assembly line operation in any type or size of material where higher loading strength and greater resistance to wear are required in tapped holes. Weighing only 18 ozs, the gun can be remotely operated up to 8 ft away from the hopper feed mechanism.

In operation, a foot actuated switch ejects an insert from the hopper mechanism through a nylon tube to the inserting tool tip. Then the operator presses the tool forward against the tapped hole. When the insert is fully installed to a preset depth, the driving mandrel automatically stops and the tool is ready for the next insert.

Booth 1828

Circle 87 on postcard for more data

New Pressure Hose

New "Hytron" Pressure Hose, utilizing the latest advances in plastic engineering materials, new Braze-Seal Tube Fittings for super pressures and high temperatures, and Aluminum Hi-Seal Fittings will be among the new products featured by The Imperial Brass Mfg. Co.

The new Hytron Hose operates in a burst pressure range of 7,000 to 12,000 psi, and consists of a heat stabilized polyamide inner tube, a plastic braid reinforcement and a polyamide braid covering which provides high resistance to abrasion, mildew, heat, sunlight and chemicals.

Booth 1606

Circle 88 on postcard for more data

New Drafting Equipment

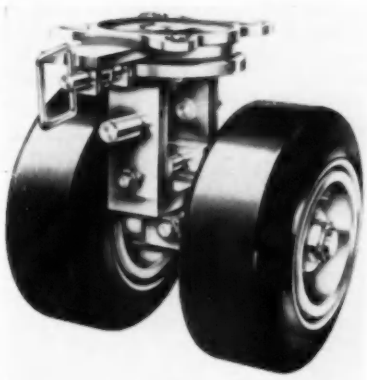
A new drafting table has been designed for use with present office desks, reference desks, or office tables. It has a flat drawing surface which is adjustable from current desk height of 29 in. to drafting table height of 38 in. New features include counterbalancing of both height and top tilt adjustments. The table top can be tilted from horizontal to vertical of 90 deg. When additional weight of drafting machines, lights, and other accessories is applied to the drafting top, the counterbalanced tilting assures smooth, controlled, floating action in angle change when top is raised to the vertical from the horizontal position. *The Mayline Company*

Booth 1615

Circle 89 on postcard for more data

Industrial Casters

A complete line of casters will be on display at the show in the Faultless Caster Corporation area. Among the new specialty casters to be spotlighted will be the dual-wheel, self



aligning caster that has been designed for heavy duty applications in industry. This unit is equipped with a four position lock and has a load rating of 2,500 lb at 10 mph.

Booth 2202

Circle 90 on postcard for more data

New Gasket Material

A newly developed high temperature conductive and shielding gasket material, known as Alu-Flex H.T., will be unveiled at the Design Engineering Show by the Auburn Manufacturing Company.

The new style Alu-Flex extends the temperature range to 500 deg F., and down to minus 65 deg F. Auburn fabricates in any size or shape gasket, seal, shim, ring, etc., or supplies it in sheets.

This new development is a silicone rubber with aluminum mesh. It was specially developed to prevent radio frequency energy from escaping at joints in closed containers with RF emitting apparatus, while also providing positive air and fluid sealing. It is available in two thicknesses, 0.016 and 0.020 in.; also by the yard in 8 in. widths or to specially cut gaskets.

Booth 1505

Circle 91 on postcard for more data

Polariscopic View

A striking visual demonstration of the advantages of a new socket screw thread form will attract viewers to the Standard Pressed Steel Co. exhibit.

The improved thread form, the SPS Hi Life, boosts tension screw fatigue life as much as 100 pct. Now standard on the Unbrako line of socket head cap screws, the Hi Life threads will be demonstrated by a Polariscope.

The SPS exhibit will also feature an operating automated set screw driver which inserts up to 2500 set screws per hour; one-piece self-locking Unbrako socket screws with Nylok for reliable holding under shock and vibration conditions, and two new miniature size Hallowell shaft collars.

Booth 2124

Circle 92 on postcard for more data

New Nylon Formulation

Various symmetrical shapes of the new Polypenco nylon will be displayed for the first time at the Design Engineering Show. In manufacturing the new line a new processing process has been employed with the formula-

tion to make these massive shapes more practical. Some of the advantages of nylon when employed as a bearing are shock resistance, corrosion resistance and the ability to operate without lubrication. These new shapes will be displayed in the Polymer Corporation Booth.

Booth 1513

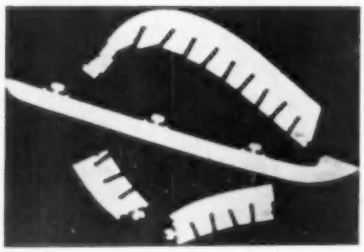
Circle 93 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Punched Car Parts

FINS, that are part of a leading automobile grille, were being produced at the rate of 1000 per hour before the installation of a new precision Flexopress. The manufacturer of this press line reports the production rate with the new press is 1000



parts every seven minutes. At this rate of production the 200 ton press is said to hold its bottom-of-ram-to-bed accuracy to 0.0005 or less per foot of bed length.

These presses are constructed with pre-loaded, ball bearing slides, and a ram that cannot oscillate. *Precision Welder and Flexopress Corp.*

Circle 50 on postcard for more data

Low Cost Lathe

INCORPORATING all the advantages necessary to make a top performance machine a new lathe has been developed for polishing, deburring, buffing and brushing operations. This unit is stripped of all "frills" that tend to make it more expensive. The capacity ranges from 10 to 20 hp and the spindle is driven by multi-V-belt sheaves. A lock pin holds the spindle stationary for work wheel replacement. The distance between the flanges, on the standard lathe, is six inches. Floor area requirements are 43 by 34 in. *Murray-Way Corp.*

Circle 51 on postcard for more data

New Butt Welder

DESIGNED for speed, stamina and simplicity of operation, a new butt welder is reported to maintain precision alignment of the part that is being welded. The clamping jaws on this unit are actuated by individual air cylinders to insure positive clamping action at all times. Upset pressure is also air operated by a third cylinder with complete control of both the upsetting pressure and the degree of upset.

A novel, non-critical automatic welding actuator has been built into this butt welder, eliminating the critical air pressure switches used on previous machines. It is only necessary to set the jaw clamps for the thickness of material being welded, set the current control switch for the degree of heat required and start welding. Further refinements such as individual setting of the clamping pressure and upsetting pressure can be made, as well as an adjustment for the degree of upset required. Pressing the foot switch causes the jaws to automatically clamp the work, apply longitudinal pressure to the pieces being welded, turn on welding current at precisely the right time, and turn off the welding current as soon as the desired upset has been obtained. *Peer Inc.*

Circle 52 on postcard for more data

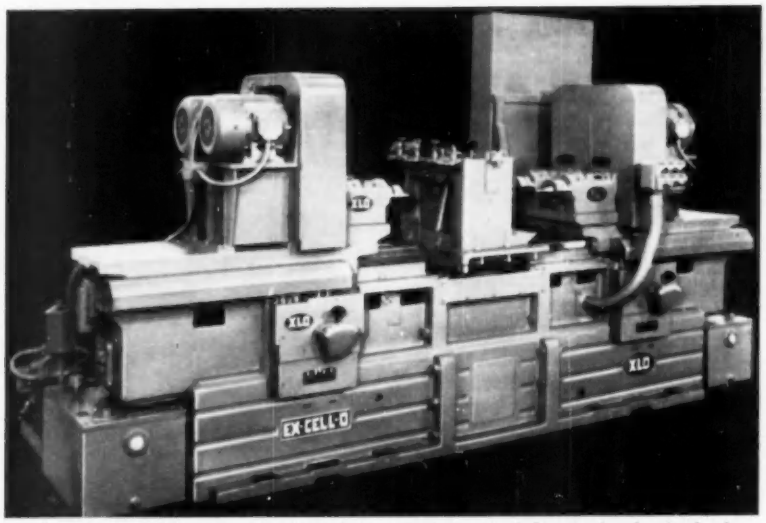
Precision Boring Crankcases for Air-Cooled Engines

THIS standard two-way precision boring machine does one of the most critical operations performed during the machining of any four-cycle gasoline engine. It performs precision boring operations on crankshaft and camshaft bearing diameters. Two workpieces are involved, one right hand, one left. The fixture accommodates both aluminum alloy components interchangeably. Changeover from one batch to another involves only a change of boring quills.

In operation, two workpieces are manually loaded. Location is taken from two previously bored dowel holes. The clamps are swung into closed position and locked hydraulically. The left slide rapids into working position and precision boring of the camshaft hole is performed in addition to facing the boss and chamfering. Tolerance on hold diameter is held within 0.0005 in.

The crankshaft bearing diameter is precision bored from spindles mounted on the right slide. Here a counterboring and chamfering operation is also performed. Hole diameter tolerance is held within 0.0003 in. *Ex-Cell-O Corp.*

Circle 53 on postcard for more data

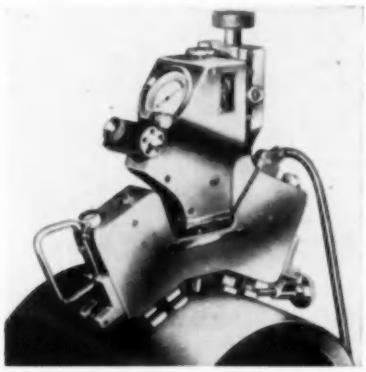


A cycle of precision operations is made in a total time, including load and unload, of only 27 seconds, achieving a gross production of 266 parts per hour.

Portable Hardness Tester

HARDNESS testing of parts and in places that would normally be inaccessible is easy with a new portable hardness tester. Designed with the same body as the successful Penetrascope Mark VIII, it is made by the same British manufacturer. Vickers hardness numbers of either curved or flat surfaces can be obtained because the tester is held by an electromagnetic clamp having four pole pieces, two of which can be adjusted to accommodate different degrees of curvature.

This new model is especially useful for testing hardness of mill rolls. Tests can be made in grooves with



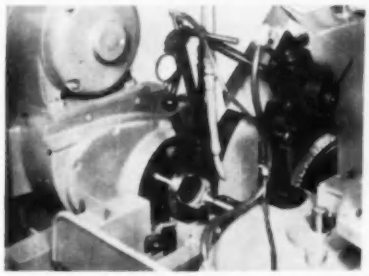
minimum width of 2 in. and to depths of 7 in. Standard loads up to 30 kg are manually applied by a hydraulic unit. The indentor is a standard 136-deg pyramid-shaped diamond. Hardness ranges from 150 to 1100 DPH (Diamond Pyramid Hardness, or Vickers) are within the capacity of this tester.

It has a 3½-in. objective and an indentor fitted to a sliding turret, remotely controlled from the body of the instrument to facilitate testing in awkward or inaccessible places. Measurement of the impression is made by means of an optical indicating micrometer with an accuracy of ± 0.001 mm. *Steel City Testing Machines, Inc.*

Circle 54 on postcard for more data

Shoulder & Shaft Grinding

SEMI-AUTOMATIC angular wheel slide grinding machines, built in 6 in. R and 10 in. L; and 10 in. R and 14 in. L, are specifically designed to combine OD and shoulder grinding in a single automatic cycle. Typical applications that this line can be used on are: crankshafts; steering knuckles;



gear blanks with hubs; and stepped shafts with critical flanges, tapers and shoulders. Built to feed at either 30 or 45 deg, these machines make it easy to obtain a circular line finish instead of a criss-cross finish. *Cincinnati Milling Machine Co.*

Circle 55 on postcard for more data

Tilt-Disc Sander

A NEW sander has been designed for finishing operations on metal,

plastic and wood. The major feature of this sander is the unitized tilting disc assembly which combines the direct motor drive, sanding disc, and safety guard, allowing use of a stationary work table. The work table always remains flat thus making heavy work pieces easier to handle. *Yates-American Machine Co.*

Circle 56 on postcard for more data

Thread Grinder Equipped With Variable Speeds

This unit was provided with a standard spindle, arranged to run at 15,000 rpm. By changing pulleys a higher or lower speed range is obtainable. To facilitate the grinding of small work, a Bryant high frequency spindle can be employed in this machine. This spindle is capable of wheel speeds adjustable from 42,000 to 60,000 rpm. Ex-Cell-O Corp.

Circle 57 on postcard for more data

News of the MACHINERY INDUSTRIES

(*Continued from page* 79)

Cadillac Hotel. Subjects discussed by speakers in 35 sessions ranged from latest metal-cutting techniques to production methods, including a number of unusual ones.

Plant tours, 17 in total, were provided for the visitors. They included visitations to Chrysler Corporation's Canadian plant, Trenton Engine Plant, and Warren Engine Div.; Ford Motor Company's River Rouge Stamping and Final Assembly Plant, Rotunda and Tool and Die Building, and Sterling Transmission and Chassis Div.; and General Motor Corporation's Detroit Engine Div., Chevrolet Motor Div., and Technical Center. In addition, Ex-Cell-O Corporation's machine tool plant in Detroit was visited.

New Officers

The Society's new officers for the ensuing year were installed at the Annual Banquet held in the Statler-Hilton Hotel on April 27.

H. Dale Long, president and chairman of the board, Scully Jones & Co., was elected president.

New **vice-presidents** are: William Moreland, vice-president, F. E. Myers & Bro. Co.; D. A. Schrom, works manager, York Div., Borg-Warner Corp.; P. R. Marsilius, vice-president, Producto Machine Co.; and F. F. Ford, president, Ford Supply Co.

H. V. Loeppert, vice-president of Boyd Wagner Co. was elected **treasurer;** and F. J. Sehn, president of Press Automation Systems, Inc., elected **secretary.**

In addition, three new **directors** were elected to the Society's board and will take office in October. They are: D. H. Brighton, a supervisor at Caterpillar Tractor Co.; Albert Underwood, Jr., superintendent of production engineering, Ford Motor Co. of Canada; and C. M. Smillie, president, C. M. Smillie Co.

Technical Sessions

The scope of the presentations at the technical sessions was quite extensive. Among the many interesting papers were the following:

At one of the sessions, four papers were centered on gun-drilling.

The "ploughing process" in metal cutting was discussed by Paul Albrecht, research associate, The Cincinnati Milling Machine Co.

Ultra high-speed machining was the subject of a paper co-authored by R. L. Vaughn, engineer, Lockheed Aircraft Corp., and R. T. Krueck, project engineer, AMC Aeronautical Systems Center, Wright-Patterson Air Force Base.

Automatic assembly machines was the theme of a paper given by A. J. LaRue, associate engineer, International Business Machines Corp.

Automation was approached from at least three standpoints in the presentations of W. C. Goeckel, sales manager of Snyder Corp.; R. B. Read, service manager of The Cross Co.; and C. F. Stugard, vice-president and manager, Special Machine Div., The Cincinnati Milling Machine Co.

Plasma-Arc techniques were discussed by J. A. Browning, director, Thermal Dynamics Corp.

Other sessions were devoted to a variety of subjects, such as standardization of machine design, value analysis, communications, radiation, sonic energy. Also explosive-forming, production programming, numerical control, and electron beam welding, among others.

Meeting of Distributors Airs Current Problems

Foreign competition was the prevalent theme at the 36th Spring Meeting of the American Machine Tool Builders' Association. Its current and potential threats to American industry—users, as well as builders and distributors, of machine tools—were aired. The speakers did not give a wholly pessimistic picture—rather, stressed the situation presented challenges which needed some real attention.

The program for the meeting—held at The Greenbriar, White Sulphur Springs, W. Va., on April 18-20—covered a number of other timely subjects. From the selling standpoint, speakers discussed sales management, a standard proposal follow-up form, a machine-tool-line justification form, and legal problems. The Machine Tool Exposition — 1960 was another major topic on the interesting agenda.

Attendance at the meeting totaled about 335 members and guests, of which some 75 were from machine tool manufacturing companies.

Foreign Competition

Both AMTDA President J. Russell Clark and guest speaker NMTBA President Alan C. Mattison centered their formal presentations around foreign competition.

Mr. Clark reviewed the decline of the U. S. watch industry, and the inroads of foreign goods—automobiles and consumer products. He pointed out "We are no longer nationally conscious when it comes to the things we buy." And it should be realized that price "may be the determining criterion for purchasing, rather than American or foreign."

Mr. Clark stated that "now is the time for us to analyze ourselves to see if we are thinking right and acting right to meet—or maybe even get ahead of—these changing patterns in industry."

He suggested "we be certain: (1) we are building the best machine tools our customer wants and needs; (2) we are not getting out of step with the metalworking

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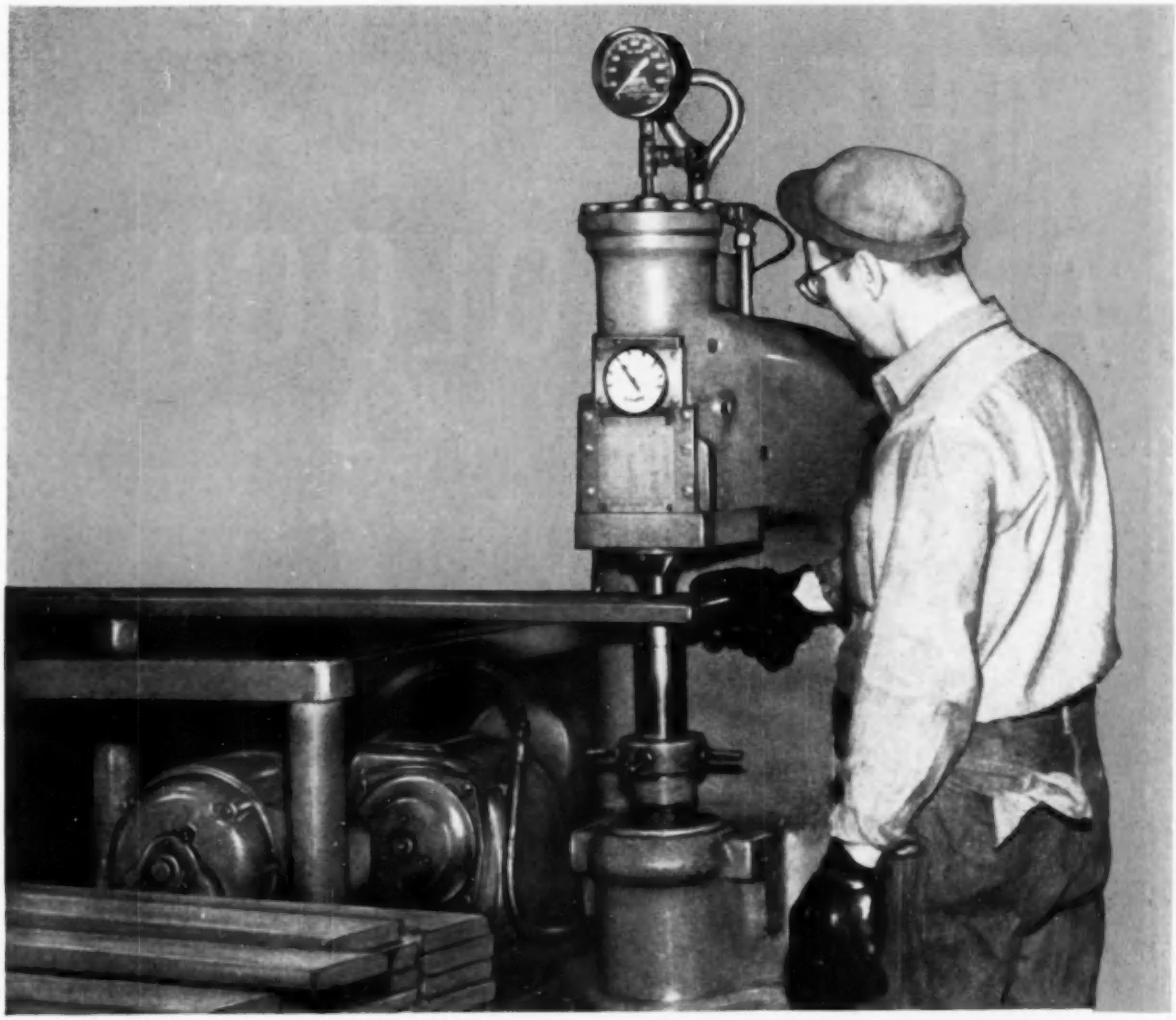
AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED



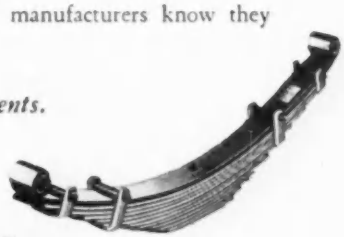
the hard facts

Brinell Testing is a simple operation. As a step in quality control, its effectiveness depends upon the thoroughness with which it is applied, and tolerances which the manufacturer establishes.

Hardness of the steel is fundamental to spring performance. Here it is tested on the latest type direct reading Brinell hardness tester. This is typical of the care that goes into Burton Springs . . . every step of the way from engineering to the finished product.

That's why so many prominent truck and off-highway equipment manufacturers know they can depend on Burton Springs.

We invite you to consult us for your next spring requirements.



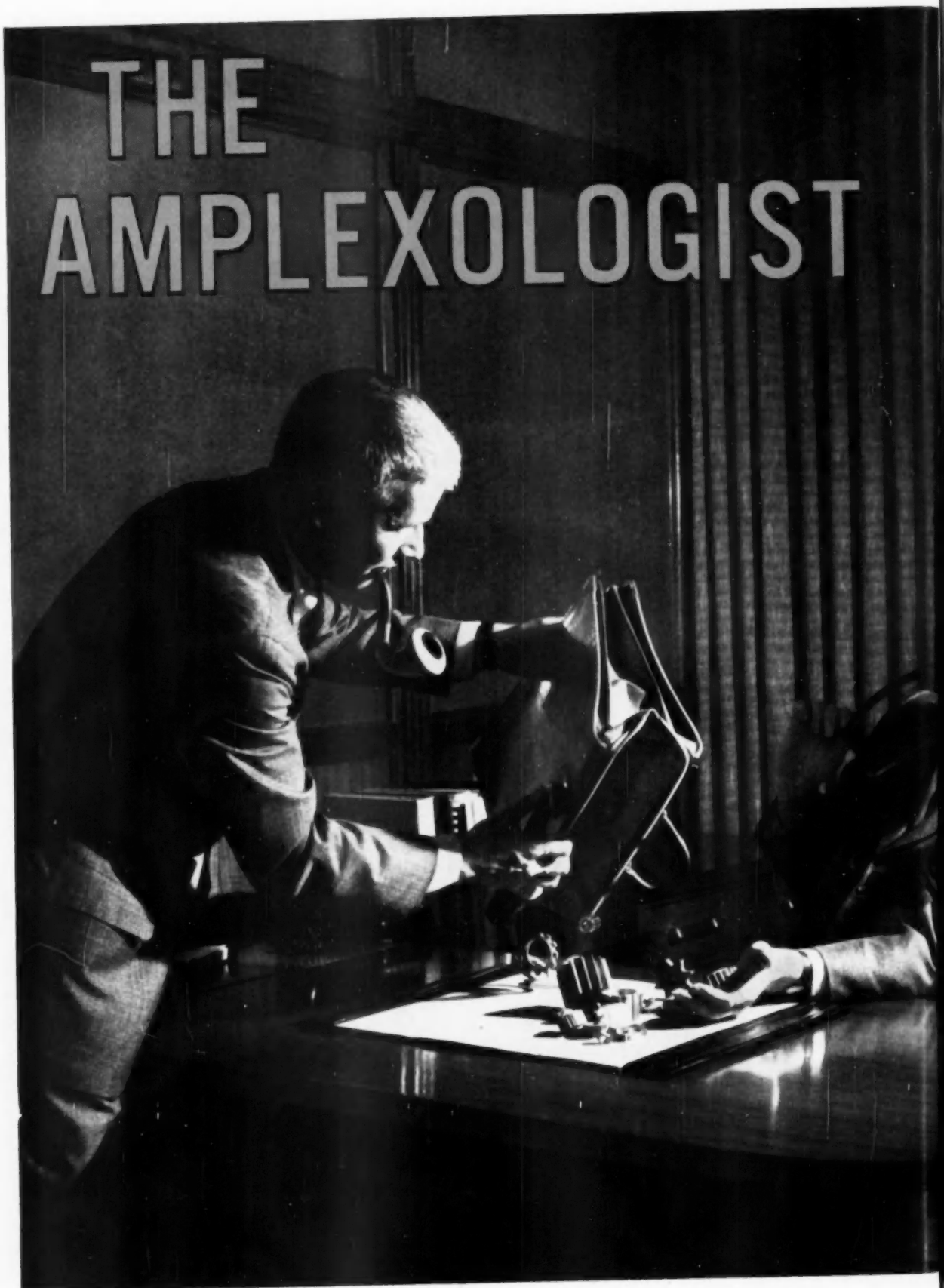
BURTON **AUTO SPRING CORP.**

Vital Support for the Automotive Industry

WESTERN AVENUE AT FORTY-EIGHTH STREET, CHICAGO 32, ILLINOIS

Circle 143 on Inquiry Card for more data

THE AMPLEXOLOGIST

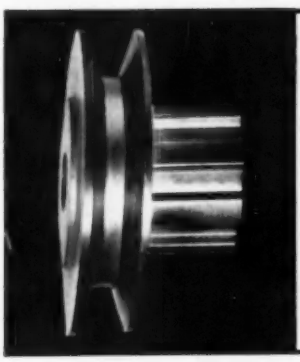


The Amplexologist is not adverse, at times, to using a little hard sell. Especially when he's talking to a hard-headed prospect. Like the manufacturer whose ideas about powder metallurgy seem to be based on information he picked up second hand in, maybe, 1935. The Amplexologist, you see, resents being told—*"It won't work, it can't be done"*—when he's doing it.

Ergo: Dump a few hard facts in the man's lap.

For example: pulleys, sprockets, cams, gears . . . in dozens of combinations of sizes and shapes. Parts that "couldn't be made" out of powder metal. Parts that Amplex—with new techniques, new alloys, advanced density control—*is* making today. Take a look!

Well, credit where credit is due. Most manufacturers, we're happy to say, are ready to revise their ideas after the Amplexologist submits the facts. Their openmindedness has saved them thousands of dollars. They like that. We like it, too. It has helped make us the world's largest and most experienced producer of powder metal parts. It's one reason so many manufacturers say: **When it comes to powder metallurgy—Amplex has the answer.**



LIKE TO LOOK AT A FEW HARD FACTS YOURSELF?

The part shown is a pulley. Amplex makes it in one piece. A precision part that requires no machining—not even of the V groove. This is one example. The Amplexologist will be happy to load his brief case, come to your office and show you many more. Could open your eyes to the possibilities of advanced powder metallurgy (i.e. Amplexology). Might save you some money, too.

AMPLEXOLOGIST

SEND COUPON **. . . if you'd like to talk over your product with the Amplexologist. Don't hesitate. He's always happy to get out of the office.**

AMPLEX DIVISION • CHRYSLER CORP. • Dept. A5
P.O. Box 2718 • DETROIT 31, MICH.

Please have the Amplexologist call to look into the possibility of using powder metal parts in our product.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

PRODUCT_____

AMPLEX

DIVISION CHRYSLER CORP.

A CHRYSLER **OILITE** PRODUCT

FORMULA FOR TOMORROW

Modern Machine Tools = Production Efficiency

THE MACHINE TOOL EXPOSITION - 1960

INTERNATIONAL AMPHITHEATRE
CHICAGO, ILLINOIS
SEPTEMBER 6-16

NATIONAL
MACHINE TOOL BUILDERS'
ASSOCIATION

MODERN MACHINE TOOLS
MMT=PE
PRODUCTION EFFICIENCY

MACHINERY NEWS

(*Continued from page* 94)

industry by either falling behind, or getting too far ahead in engineering; (3) we as an industry are as cost-conscious as we urge our customers to be; and (4) we are not using 1900 selling methods to compete in 1960."

In conclusion, Mr. Clark declared "we . . . must understand one thing." That "a modern machine tool installed in the U. S. is one more fibre to our economic strength—and one more advantage in our economic race for survival."

Alan C. Mattison, president of the National Machine Tool Builders' Association, stated the situation in the machine tool industry "presents both a challenge and an opportunity."

He said he is not concerned with the ability of American-built machine tools to compete with foreign machines on design and performance. That "the research and development work which has been going on during the last five years has been astounding." But that "we simply cannot ignore the factor of cost."

Mr. Mattison urged that sales costs, just as manufacturing costs, be given careful study in the effort to compete more favorably. Also that detailed analyses be made "to figure out an intelligent allocation of territories and to estimate the number of sales calls that should be made in each territory."

"The threat of European competition throughout the American metalworking industry in general," Mr. Mattison said, "should provide a sales opportunity such as we have not had in a long time." He remarked that the only way to meet foreign competition in U. S. markets is for manufacturers to get their costs down to where they can offer competitive values. And that the sole means available for doing so is to modernize plant and equipment.

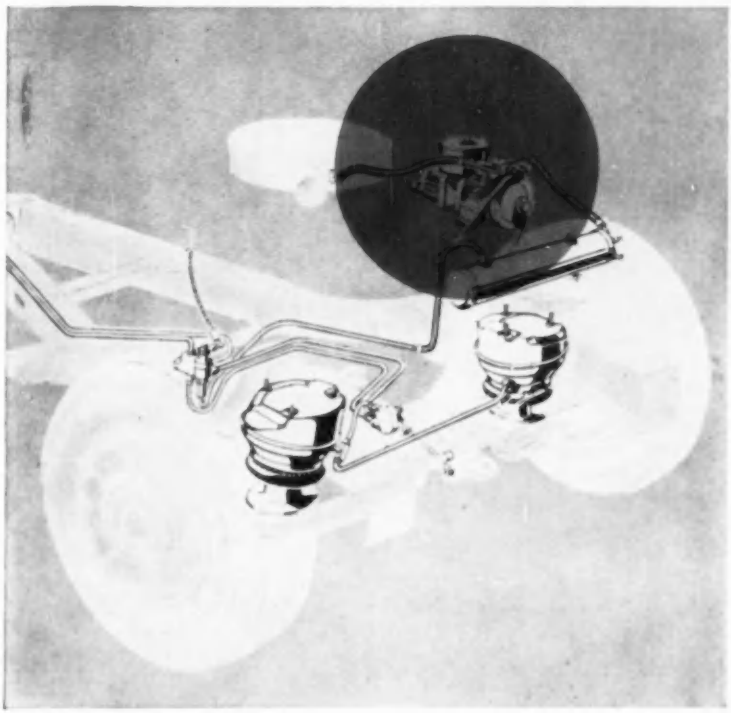
He said "our job is to convince metalworking manufacturers in the U. S. to modernize, on behalf

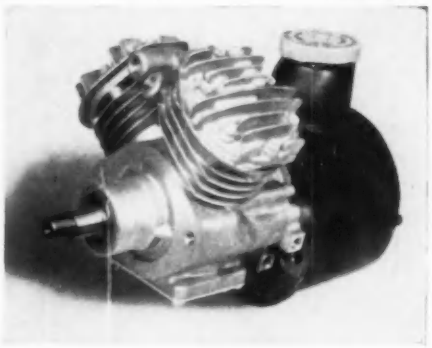
(*Turn to page* 102, *please*)

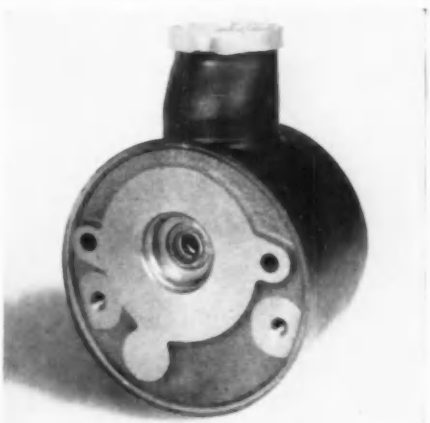
Circle 145 on Inquiry Card for more data

SILICONE NEWS from Dow Corning

Seals Hot Oil, Stays Springy







SILASTIC® SILICONE RUBBER Keeps Fluid in Place at −30 and 350 F

Here is a rubbery material that resists automotive hydraulic fluid and stays springy over a wide temperature range. It's Silastic, the Dow Corning silicone rubber, and it's doing rugged duty in some new cars.

Automotive engineers designed the dual device shown above. It consists of an air compressor and a pump assembly, operating in tandem off the same drive shaft . . . one pumping a synthetic hydraulic fluid to the power steering system, the other compressing air for pneumatic suspension. Obviously, some sort of seal was necessary to prevent fluid from leaking along the shaft from the pump into the air compressor. Because of possible shaft wobble or misalignment, the seal had to be flexible.

To solve the problem, they engineered a floating oil seal of Silastic. Thanks to the properties of Silastic, this seal works beautifully despite rpm's up to 6,000 and operating temperatures up to 350 F. The Silastic is also completely flexible at −30 F and is actually suitable for use from −130 to 500 F. The engineers are so pleased with the field performance of Silastic that they're now considering extending its use to many other new product design areas.

If you have need of such a flexible, durable material, investigate Silastic. Your rubber fabricator can engineer a part to your specifications. Or, for data, write Dow Corning, Dept. 0605.

Typical Properties of Silastic for Seals

Temperature range, F	−130 to 500
Tensile Strength, psi	600 to 1400
Elongation, %	150 to 300
Tear Strength, lb in	40 to 180
Compression set, % at 300 F	5 to 50
at 450 F	60
Hardness Range, durometer	20 to 80

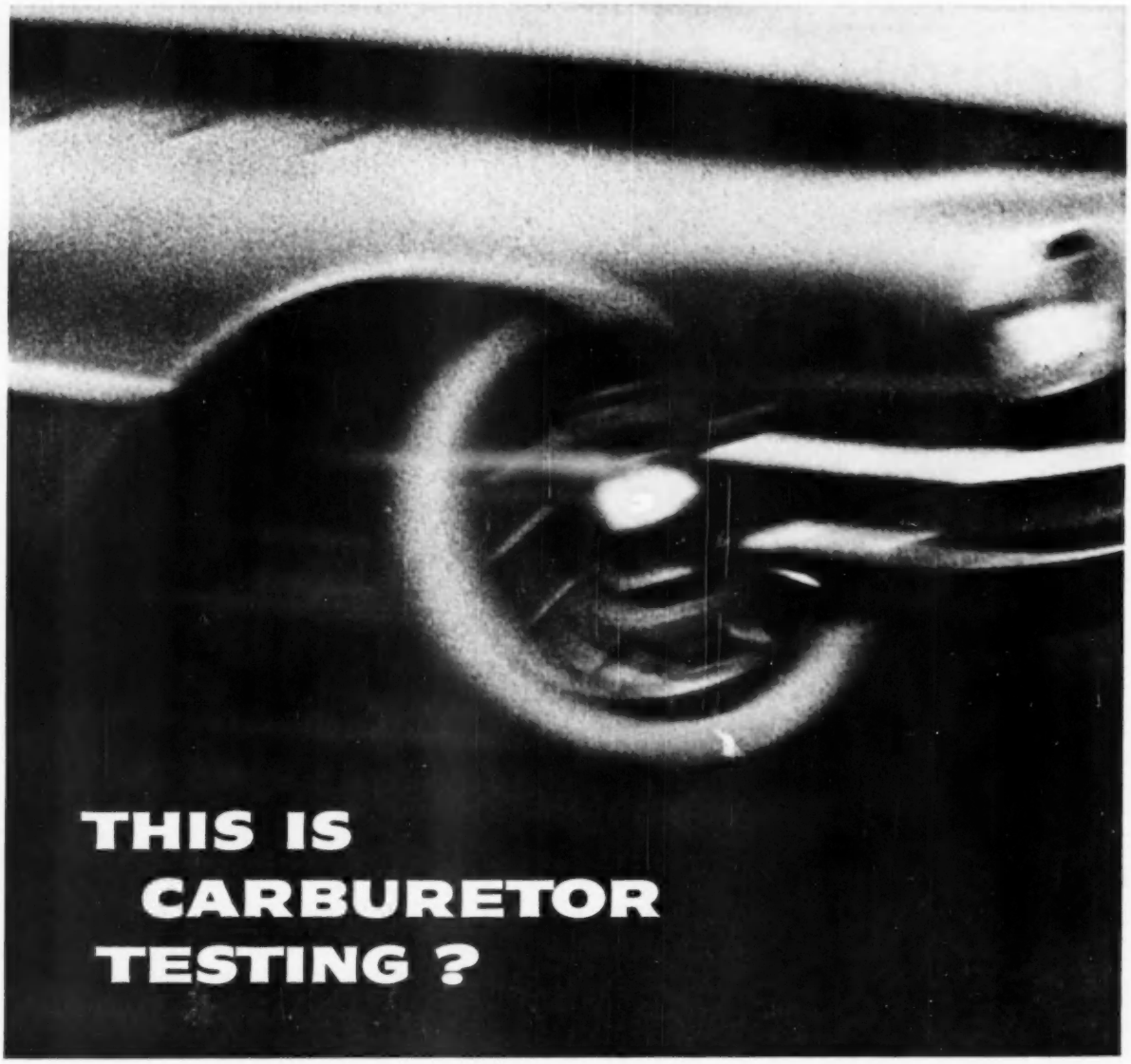
If you consider *all* the properties of a silicone rubber, you'll *specify Silastic.*

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

Circle 146 on Inquiry Card for more data



THIS IS CARBURETOR TESTING ?

it certainly is, for maneuvers such as this abrupt cornering set up unusual liquid displacement and mechanical stress conditions. Rochester-GM Carburetors are built to function without a whisper of complaint throughout such tests. This one was at the GM Proving Ground at Milford. Others go on at the GM Desert Proving Ground in Arizona and, of course, we never cease testing right here in the factory. Rochester-GM Carburetors are expected to please the ultimate consumer, the dealer, his service people and those hardest of all to please—the car engineers. We leave no stone unturned to see that you—wherever you are in this chain—are satisfied with Rochester-GM Carburetors. *Rochester Products Division of General Motors, Rochester, New York.*

GM CAR GENERAL MOTORS

America's number one original equipment carburetors

ROCHESTER CARBURETORS

Circle 147 on Inquiry Card for more data

Visit us at the 1960 Design Engineering Show, New York Coliseum, May 23-26, 1960, Booth 1303

for a "creative analysis" of your circuit termination program . . .

it's about time

That's what C A is all about—time, your time . . . and money and circuit reliability.

AMP's Creative Analysis is a cost-free program that studies every aspect of your termination department and its relation to your total manufacturing operation. Not a superficial glossing of obvious facts, C A is a penetrating, thorough examination by a team of experts.

We've done hundreds of Creative Analysis Studies, cutting costs 50%, 100% and more . . . boosting production manyfold . . . and solving the most stubborn problems of reliability.

It's time to look at your circuit termination program—time to discover if you have the most efficient operation possible. In fact, it's time to send for our brochure on C A.

AMP INCORPORATED

GENERAL OFFICES: HARRISBURG, PENNSYLVANIA

AMP products and engineering assistance are available through subsidiary companies in Australia • Canada • England • France • Holland • Italy • Japan • West Germany

MACHINERY NEWS

(*Continued from page* 98)

of survival—to modernize, to meet the threat of foreign competition. And the best way to do that is to persuade them to come in person to The Machine Tool Exposition—1960 and see for themselves the cost-saving potentialities of the machines displayed." Mr. Mattison predicted, "When top executives see and understand the extent to which they can actually get more output per hour at lower cost, I believe the result will be a whole new wave of modernization that will sweep the country."

Mr. Mattison also commented briefly on "unfounded rumors" to the effect that American machine tool builders are going to shift production capacity from the U. S. to Europe. He declared that production arrangements had been made abroad "for the purpose of enabling them (the builders) to compete in European and other foreign markets." And that "we are not taking capacity away from this country and putting it over there. We are establishing facilities over there because otherwise we can't sell over there."

Proposal Follow-Up

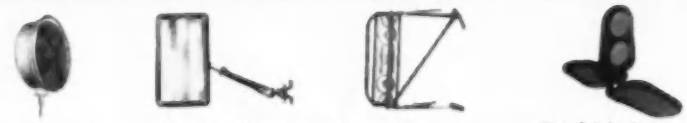
NMTBA and AMTDA, jointly, have evolved a proposal follow-up form for overall industry use. It was described and presented to AMTDA membership at the meeting by J. A. Haman, president of Haman Machinery & Supply, Inc. —following committee studies conducted during the past year.

The objective of this development was to come up with a standardized form which would be acceptable to all machine tool builders. Thus, sales reporting for distributor representatives could be simplified as compared to the practice of using different forms for the various builders' reports.

The new report form appears to be a practical solution to the problem; and is to be distributed generally for builder consideration. ■

For the best in original equipment — specify Miro-Flex truck, trailer, and tractor lamps and reflectors! Immediate delivery for O. E. M. — on all types of clearance lights, turn-signal and marker lamp assemblies, stop lights, and reflectors. Miro-Flex leads the way . . . for finest heavy-duty quality lamps and reflectors, at lowest cost! Send for free catalog of Miro-Flex lamps, reflectors, and safety equipment, today!

FULL LINE OF SAFETY EQUIPMENT



Turn, Stop, and Tail Lights | Standard Mirror Assemblies | Heavy-duty West Coast Mirrors | The Original Miro-Flare

THE MIRO-FLEX CO., INC. 1824 E. SECOND WICHITA 14, KANSAS

M-160

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

Automotive AIR CONDITIONER SALES

(*Continued from page* 81)

Automotive Air Conditioning Manufacturers Association, share the optimism of the car builders—a 100 per cent sales boost in 1960.

EQUIPMENT All systems basically consist of a compressor, condenser, receiver, expansion valve, evaporator and blower.

The compressor, either a rotary or reciprocating unit, is mounted on the top front of the engine and driven by a V-belt connected to a special pulley installed on the engine crankshaft. Controlled through a magnetic clutch and a hot gas bypass valve, the unit compresses and raises the temperature of the refrigerant low pressure gas, con-

(*Turn to page* 106, *please*)

STAMINA . . . heavy loads go farther on Bower Bearings

Moving a missile from coast to coast takes bearing muscle aplenty. And its on-schedule arrival depends on perfect —repeat, *perfect*—bearing performance.

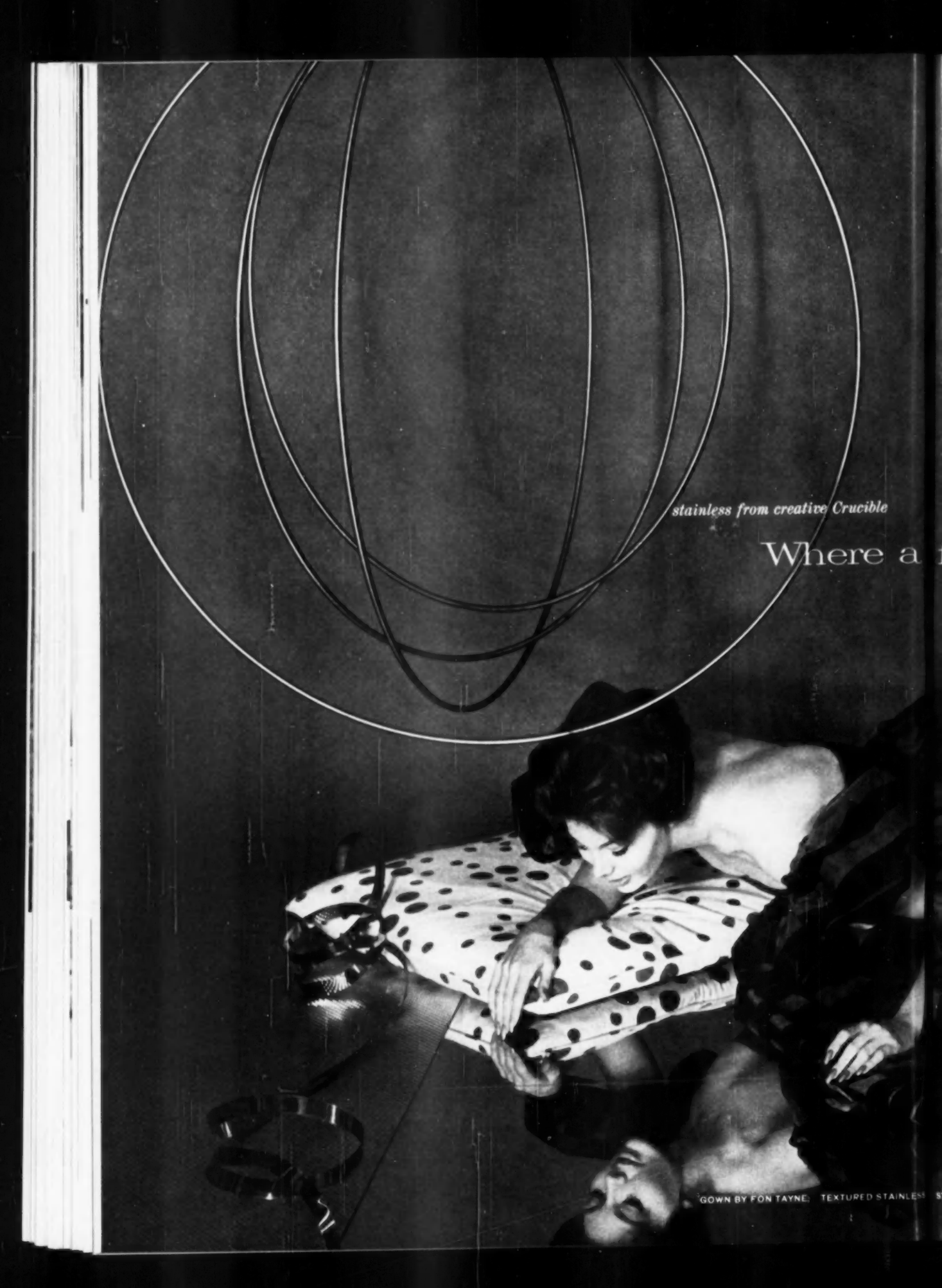
To roll the load surely, safely, on time you can depend on Bower bearings. The extra assurance, extra service they give results from definite design advantages. Spherically generated roll heads, higher flanges and larger two-zone contacts translate into trouble-free service, reduced maintenance, longer bearing life.

Whether you build, buy or maintain trucking equipment—or *any* product that uses roller bearings—ask for Bower first. You can select from a complete line of tapered, straight and journal roller bearings for every field of transportation and industry.

BOWER ROLLER BEARINGS

Bower Roller Bearing Division • Federal-Mogul-Bower Bearings, Inc. • Detroit 14, Michigan

Circle 150 on Inquiry Card for more data Circle 151 on Inquiry Card for more data →


stainless from creative Crucible
Where a
GOWN BY FON TAYNE. TEXTURED STAINLESS

The lustrous finish of Crucible stainless reflects steelmaking perfection. But steelmaking to exacting specifications is only the beginning of engineering and warehouse services that are continually available to you. To see how they'll help you enhance your product with stainless steel, just call or write the nearest of the 34 local Crucible service centers.

CRUCIBLE

Stainless Steel

STAINLESS STEEL BY RIGIDIZED METALS CORPORATION; STAINLESS SHEET, STRIP, ROD AND WIRE BY CRUCIBLE STEEL COMPANY OF AMERICA, PITTSBURGH 30, PA

Binks Airless spraying outfits are available for pumping paints direct from 55- or 10-gallon shipping containers to spray guns.

Facts

you should know about

Airless spraying

Q: *Is airless atomization spraying the answer to all spray painting and coating problems?*

A: No! Not by a long shot.

Q: *Where, then, is airless spraying best used?*

A: It is excellent for indoor and outdoor painting maintenance or production work because there is virtually no overspray.

Q: *Does Binks manufacture airless spraying equipment?*

A: Yes. These rugged, dependable and mobile outfits incorporate the latest developments.

Q: *Why see Binks first when thinking of airless equipment?*

A: Binks offers you a complete line of spraying equipment. Only Binks offers you the opportunity to objectively compare airless with other techniques to select the equipment best suited to *your* requirements. Binks engineering assistance on finishing problems is likewise completely objective.

Q: *How can more facts be obtained on Binks airless units?*

A: Ask your Binks industrial distributor for Binks Bulletin A98-7. Or, call your nearest Binks Branch Office or write direct.

9619

Binks

EVERYTHING FOR SPRAY PAINTING

SPRAY GUNS

AUTOMATIC EQUIPMENT

ELECTROSTATIC EQUIPMENT

Binks Manufacturing Company

3120-30 Carroll Avenue West, Chicago 12, Illinois

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

Automotive AIR CONDITIONER SALES

(*Continued from page* 102)

verting it to a high temperature, high pressure gas which passes to the condenser.

The condenser, which closely resembles a radiator core, is installed directly in front of the radiator of the vehicle. When the refrigerant goes into the condenser in the form of high temperature, high pressure gas, the air passing through the tubes and fins cools the refrigerant. This cooling action actually changes or converts (condenses) the refrigerant from a gas to a liquid. Upon leaving the condenser, the refrigerant, in a liquid high pressure state, is moved to the receiver.

The receiver is simply a storage tank. The refrigerant leaves this container and passes through a sight glass on the way to be dried. The sight glass reveals whether the system is charged (bubbles indicate the system is not fully charged).

The drier unit contains chemicals that both dry and filter the refrigerant on its passage to the evaporator.

Mounted in the trunk or under the cowl, the evaporator is that part of the system where the actual cooling takes place. The high pressure liquid passes through a metering valve which regulates and restricts the flow to the evaporator. Leaving the valve, the pressure of the refrigerant is reduced, causing the liquid to vaporize. The temperature drops with the reduced pressure, cooling the copper tubing through which it passes. The air, cooled by passing over the tubing, is then forced into the car. Upon leaving the evaporator, the refrigerant is converted back to a low pressure warm gas and is shunted back to the suction side of the compressor.

The master control for the entire system is the thermostatic expansion valve, referred to above as a metering valve. Just as the name suggests, this valve operates by thermal means and automatically

Circle 152 on Inquiry Card for more data

LIPE Clutches Cut Truck Operating Costs

say increasing numbers of big users . . .

IT'S what the clutch does on the road that sells the experienced truck user. His only measuring stick is overall costs. In important and increasing numbers, that measure is causing him to buy Lipe Heavy-Duty DPB's . . . both on new trucks and as replacements of original equipment.

Don't risk the owner loyalty of this big and growing body of users. Sell them what they want . . . LIPE . . . either as standard or optional equipment. Let the men who pay the bills prove to you that . . .

the trend is to LIPE.

For more ton-miles and more engagements between shop-stops, equip with Lipe Heavy-Duty DPB Clutches. Single and two-plate types; 12", 13", 14" and 15" sizes: torque capacities from 300 to 1900 ft.-lbs.

Lipe-ROLLWAY CORPORATION SYRACUSE 1, N. Y.

Circle 153 on Inquiry Card for more data

controls the expansion or evaporation of the Freon in the evaporator at the rate required to maintain desired cooling.

The location of the evaporator varies with the make and model of equipment. Some units are located under the cowl, some in the trunk, while others can be added to the roof. Generally all evaporator cabinets house blowers and adjustable louvers for forced directional cooling.

Cab air conditioning for trucks requires heavy duty equipment that will efficiently handle "sweat box" conditions for sustained periods. The truck engine, operating continuously eight to ten or more hours at a time, rejects more heat than the automobile engine. Hard driving and mechanical abuse preclude the use of standard automotive assemblies. The truck air conditioner, to give adequate value, must be efficient, reliable and rugged.

Basically, there are three types of truck air conditioning systems currently available: (1) the automotive (integral) type; (2) the truck powered unit and (3) the self-powered air conditioner.

The automotive type is similar to the system previously discussed with the exception of heavy duty components.

The truck powered unit is a deviation from the standard automotive type and the self-powered configuration. Power is supplied by the truck engine, and all components with the exception of the compressor and clutch assembly are located in one package on the cab roof.

The self-powered air conditioner is completely independent from the truck engine. It carries its own power source (usually a gasoline or LPG engine) that is mounted externally. Some systems incorporate a separate fuel tank and fuel pump.

The importance of this facet of the market is emphasized in new designs that are being tailored specifically for trucks. It is no longer a problem of modifying other systems or makeshift equipment.

HUMAN ENGINEERING

The increasing awareness by the motorist of such features as rapid cool-down and the elimination or reduction of traffic noise, drafts, dust, odors, etc. has directly influenced the demand for comfort controlled cars and trucks. The theorem that man is the product of his environment has recently emphasized the desirable side-effects of air conditioning—increased driver efficiency, higher morale and improved safety records.

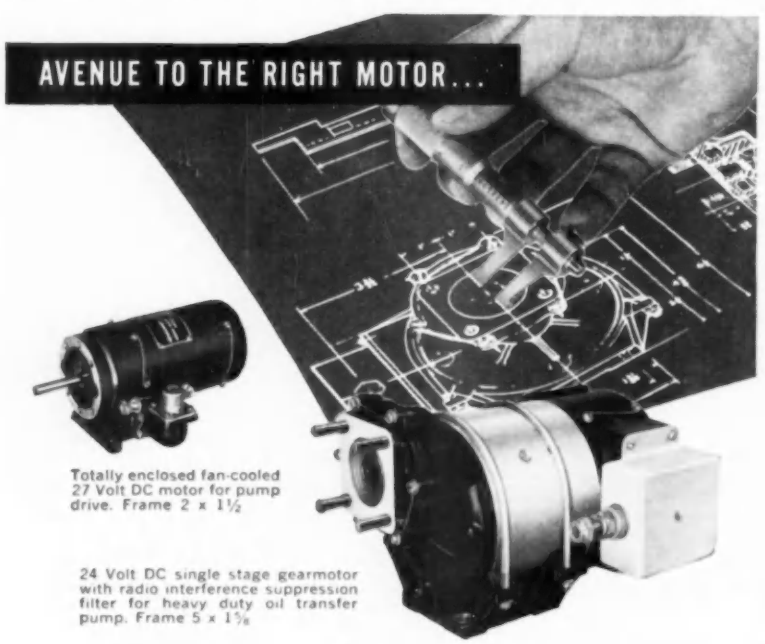
A survey conducted by Du Pont to study the attitudes and opinions of its salesmen in air conditioned cars revealed that over 90 per cent reported (1) improved job performance, (2) higher customer call rate, (3) lower fatigue level, (4) improved personal appearance, (5) sustained alertness and (6) better driving records.

These benefits should be of significance to all fleet operators and sales managers with cars on the street.

WHAT'S AHEAD

No new revolutionary systems are in sight within the immediate

(*Turn to page* 118, *please*)



Totally enclosed fan-cooled 27 Volt DC motor for pump drive. Frame 2 x 1½

24 Volt DC single stage gearmotor with radio interference suppression filter for heavy duty oil transfer pump. Frame 5 x 1⅞

12 Volt DC split series motor for operating landing gear on commercial airplanes. Frame 2¼ x 1¼

Four-pole 400 Cycle AC motor incorporating two-stage centrifugal blower with multiple air outlets. Frame 2¼ x 1

A design that meets your exact motor requirements

Into the design of a Lamb® motor goes our 45 years of specialized experience in powering aircraft components, industrial, commercial and domestic products.

Out of the design comes a motor having the dependability and smooth, efficient operation required for the exceptional performance of your product.

These advantages are standard with Lamb motors . . . engineered to your exact requirements . . . mass produced to obtain most favorable cost. *Descriptive folder sent on request.*

THE LAMB ELECTRIC COMPANY
KENT, OHIO

A Division of American Machine and Metals, Inc.
In Canada: Lamb Electric
Division of Sangamo Company Ltd. — Leaside, Ontario

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER **MOTORS**

Divisions of American Machine and Metals, Inc., New York 7, New York TROY LAUNDRY MACHINERY • RIEHLE TESTING MACHINES • DE BOTHEZAT FANS • TOLHURST CENTRIFUGALS • FILTRATION ENGINEERS • FILTRATION FABRICS • NIAGARA FILTERS • UNITED STATES GAUGE • RAHM INSTRUMENTS • LAMB ELECTRIC CO. • HUNTER SPRING CO. • GLASER-STEERS CORP.

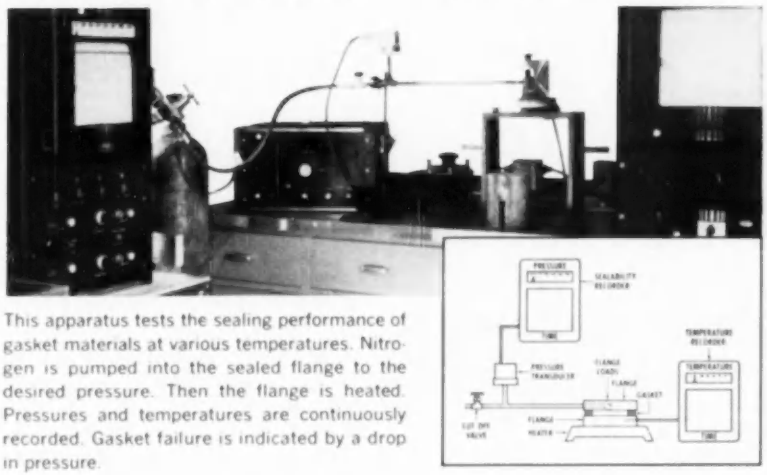
HEAT and GASKETS

Heat can affect the performance of resilient gasket materials. Its effects can be minimized, however, by proper selection of materials and special consideration of certain mechanical aspects of the joint.

E. M. SMOLEY
Research Physicist
Armstrong Research and Development Center

Where resilient gasket materials will be used at temperatures substantially higher than room temperature, the possible effects of heat must be considered.

Actually, heat is less of a limiting factor than is commonly supposed. By knowing the range of temperature limits of the various classes of materials (see table), a designer may be able to find a resilient gasket that meets his temperature requirements just as well as a more expensive material.



This apparatus tests the sealing performance of gasket materials at various temperatures. Nitrogen is pumped into the sealed flange to the desired pressure. Then the flange is heated. Pressures and temperatures are continuously recorded. Gasket failure is indicated by a drop in pressure.

Resilient gaskets usually are organic, and exposure to high temperature can cause physical damage such as charring . . . or it may volatilize the fugitive binders of some plant fiber materials. Such damage will, of course, eventually result in leakage. It usually can be avoided by staying within recommended temperature limits of the material or by using an inorganic gasket such as Armstrong asbestos Accopac.

A more subtle effect of heat—and one more difficult to detect—is the softening it tends to produce in almost any nonmetallic gasket. Because of plastic flow or some form of fatigue, high temperatures act to reduce the ability of a resilient gasket to maintain flange pressures over relatively long periods. The result can be serious loss of bolt torque.

This torque loss can be minimized by using rigid flanges that can impose adequate flange loads on the gasket; and by selecting a gasket material with good torque retention properties (see table). The Armstrong Accopac line contains a number of asbestos fiber materials which have excellent torque retention characteristics.

Class of material	Maximum sustained temperature at gasket line*	Rank in order of torque retention
Asbestos	**750° F.**	**1**
Cellulose	**300° F.**	**2**
Cork-and-rubber	**250° F.**	**3**
Straight rubber	**250° F.**	**4**
Cork composition	**250° F.**	**5**

* These are recommended design limits. Obviously, in many applications temporary exposure to higher temperatures can be tolerated. Consideration should also be given to nature of contained fluids, since some fluids which are inert at room temperature become more active as temperatures increase.

Checking the effects of heat is just one part of a continuous test program on gasket materials at our Research and Development Center. The experimental apparatus shown at left is one of many similar devices used to study the behaviors of gasket materials under a wide variety of laboratory and simulated service conditions.

The Armstrong Gasket Design Manual contains additional data on the effects of heat as well as much other detailed information on the design, selection, and performance of resilient gasket materials. Write for your free copy today to Armstrong Cork Company, Industrial Division, 7105 Imperial Ave., Lancaster, Pennsylvania.

Armstrong GASKET MATERIALS

1860–1960 Beginning our second century of progress

Circle 155 on Inquiry Card for more data

Trends in the
CONSTRUCTION EQUIPMENT INDUSTRY

(*Continued from page* 69)

New Transmissions

Transmitting the power to the wheels at the desired torque and speed is difficult. The turbine turns at a rather high speed—30,000 rpm or so—which must be geared down to less than 100 rpm at the wheels of a big vehicle. In the simple single-shaft turbine, output torque falls off as speed is reduced, even more rapidly than in a piston engine. Starting torque can be improved by use of a two-shaft turbine, but a most attractive system would be the electrical drive, with separate dc motors on each wheel of the vehicle.

Efficient Fuel Cells

The fuel cell, avoiding the losses inherent in any heat engine, and having an efficiency even in first hand-built test models higher than that of the best heat engine, must be considered in any future power plant study, Dr. Ihrig told the meeting. Allis-Chalmers has obtained an efficiency of about 60 per cent with its first large-scale model.

Remote Controls

Electrical and electronic remote control systems for earthmoving machinery are available, and are now being offered as optional equipment on present machines, Joseph T. Osterman, Electric Products Div., Electric Autolite Co., told the meeting. Controls to guard against abuse or overloading of equipment, or to speed up operations or make them more precise, are rapidly becoming economic necessities. ■

JOHNSON *tappets*

***for all engine applications**

All of the engineering and manufacturing effort at Johnson Products goes into producing a better tappet. Continual experimentation and exacting quality control make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of hardenable iron, steel, and chilled iron of various alloys, are used in JOHNSON TAPPETS. These tappets are successfully used in jobs ranging from light duty to the most severe, punishing applications. Serving all industry that employs internal combustion engines.

Johnson TAPPETS

"tappets are our business"

JOHNSON JP PRODUCTS inc.

MUSKEGON, MICHIGAN

Circle 156 on Inquiry Card for more data

DESIGN SHOW PREVIEW

(*Continued from page* 87)

Wednesday, May 25
AUTOMATION

Co-Chairmen—George F. Hawley, Director of Development and Engineering, Automation Engineering Laboratory, Inc., Stamford and Greenwich, Conn.; Allan Harvey, President, Dasol Corp., New York, N. Y.

"Concept of Modular Design for Mechanized Assembly"

Speaker—A. A. Lawson, Consulting Project Engineer, Melpar Inc., Falls Church, Va.

"Basic Design Parameters for Automatic Assembly"

Speaker—Robert Esken, Supervisor, Engineering & Sales Application, Autometrology Section, Sheffield Corp., Subsidiary of Bendix Aviation Corp., Dayton, Ohio.

Thursday, May 26
USE OF COMPUTERS IN DESIGN

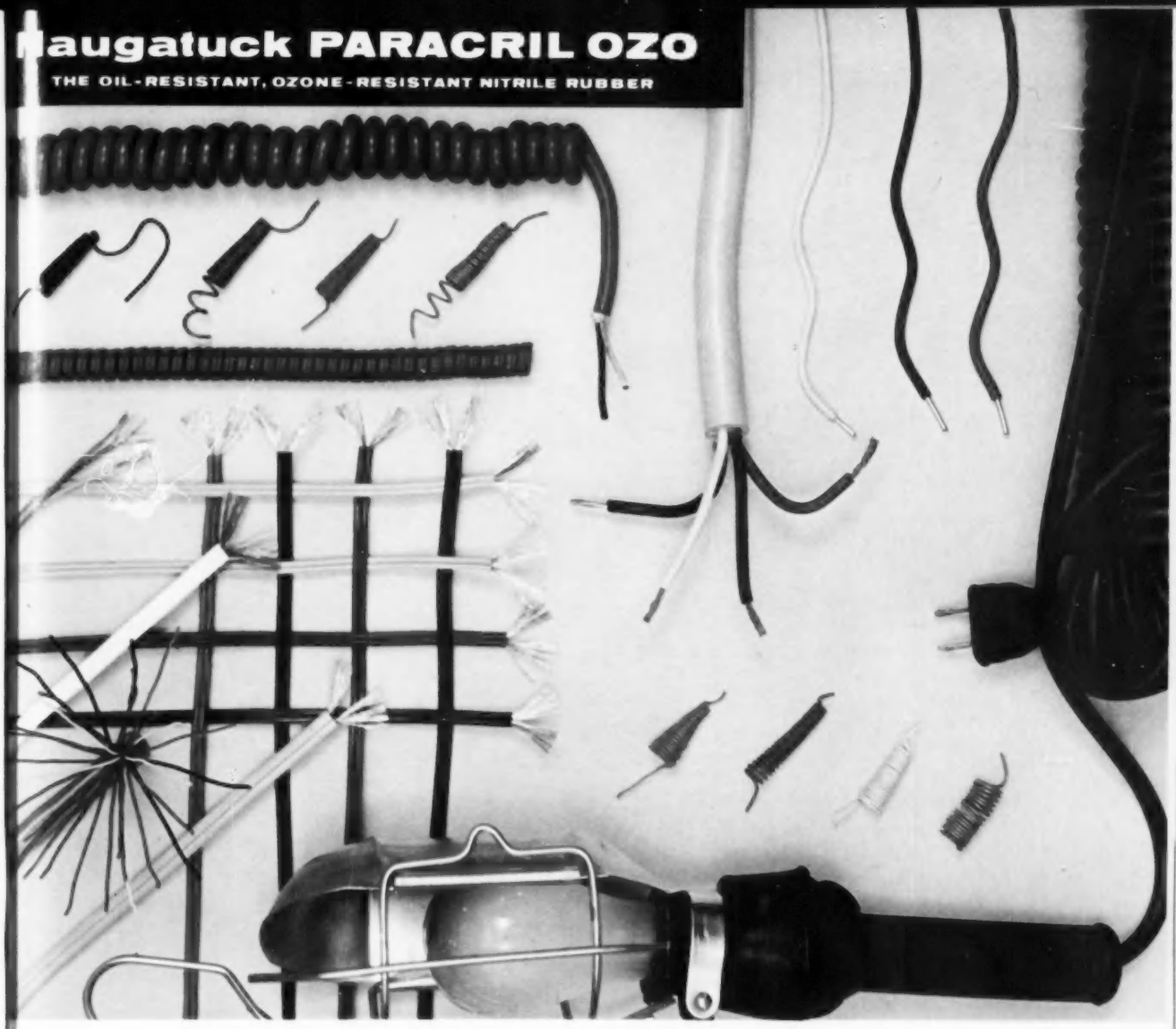
Co-Chairmen—Dr. Julius S. Aronofsky, Manager, Electronic Computer Center, Socony Mobil Oil Co., Inc., New York, N. Y.; Raymond Payne, Supervisor, Engineering Computer Section, Worthington Corp., Harrison, N. J.

Panel Members:—E. F. Magnusson, Mathematician, Control Programming, General Engineering Laboratory, General Electric Co., Schenectady, N. Y.; George Ryckman, Supervisor, Machine Operations, General Motors Research Laboratories, General Motors Corp., Detroit, Mich.; Dr. Aaron Finerman, Manager, Digital Computing and Data Processing Div., Republic Aviation Corp., Farmingdale, N. Y.

Circle 157 on Inquiry Card for more data

Naugatuck PARACRIL OZO

THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER



Great new advance in wire jacket rubber

Now you can give your wire and cable jacketing new resistance to cuts and abrasion, superior resistance to attack by oils and solvents, outstanding new resistance to weather and ozone . . . *and enjoy all the benefits of color, too.*

Color code for fast, unerring identification . . . color for smart, modern appearance . . . to call attention . . . to hide . . . to add solid new sales appeal. Because PARACRIL® OZO takes and retains any color you desire, permanently.

In addition to color, PARACRIL OZO offers such advantages as:

- significantly superior ozone resistance
- excellent resistance to fuels, oils, and solvents
- exceptional abrasion resistance
- high physical properties
- good flame resistance

Try new PARACRIL OZO. See why it offers makers and users of not only wire and cable jackets, but of rubber products by the hundreds a host of valuable new selling possibilities. For more information, for samples, for technical assistance with a present or proposed application, contact your Naugatuck representative or the address below today.

Naugatuck Chemical

Division of United States Rubber Company Dept. A Elm Street Naugatuck, Connecticut

US RUBBER

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co. Ltd. Elmira, Ontario · CABLE: Rubexport, N.Y.

Trends in the

CONSTRUCTION EQUIPMENT INDUSTRY

(*Continued from page* 69)

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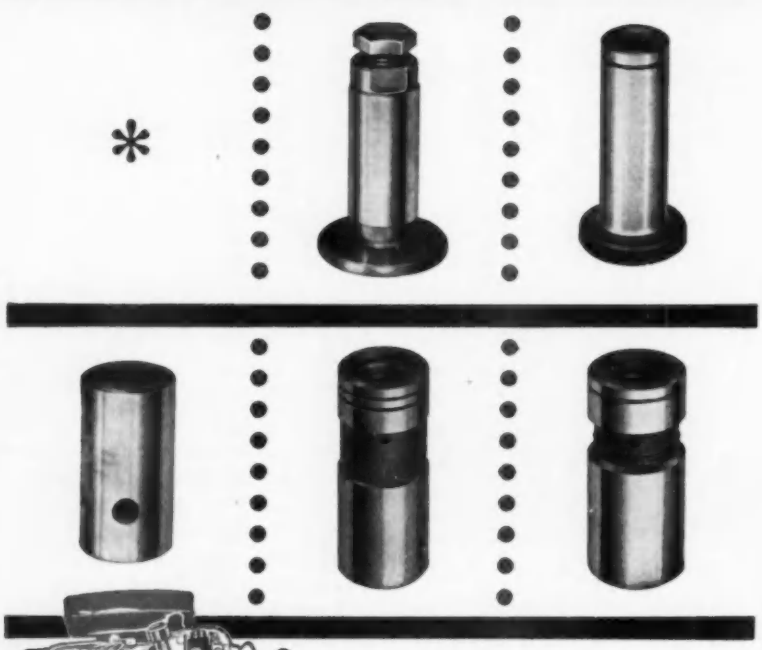
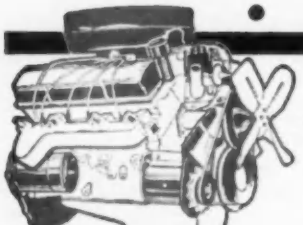
JOHNSON *tappets*





**for all engine applications*

All of the engineering and manufacturing effort at Johnson Products goes into producing a better tappet. Continual experimentation and exacting quality control make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of hardenable iron, steel, and chilled iron of various alloys, are used in JOHNSON TAPPETS. These tappets are successfully used in jobs ranging from light duty to the most severe, punishing applications. Serving all industry that employs internal combustion engines.

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"tappets are our business"

JOHNSON JP PRODUCTS

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Circle 157 on Inquiry Card for more data ⟶

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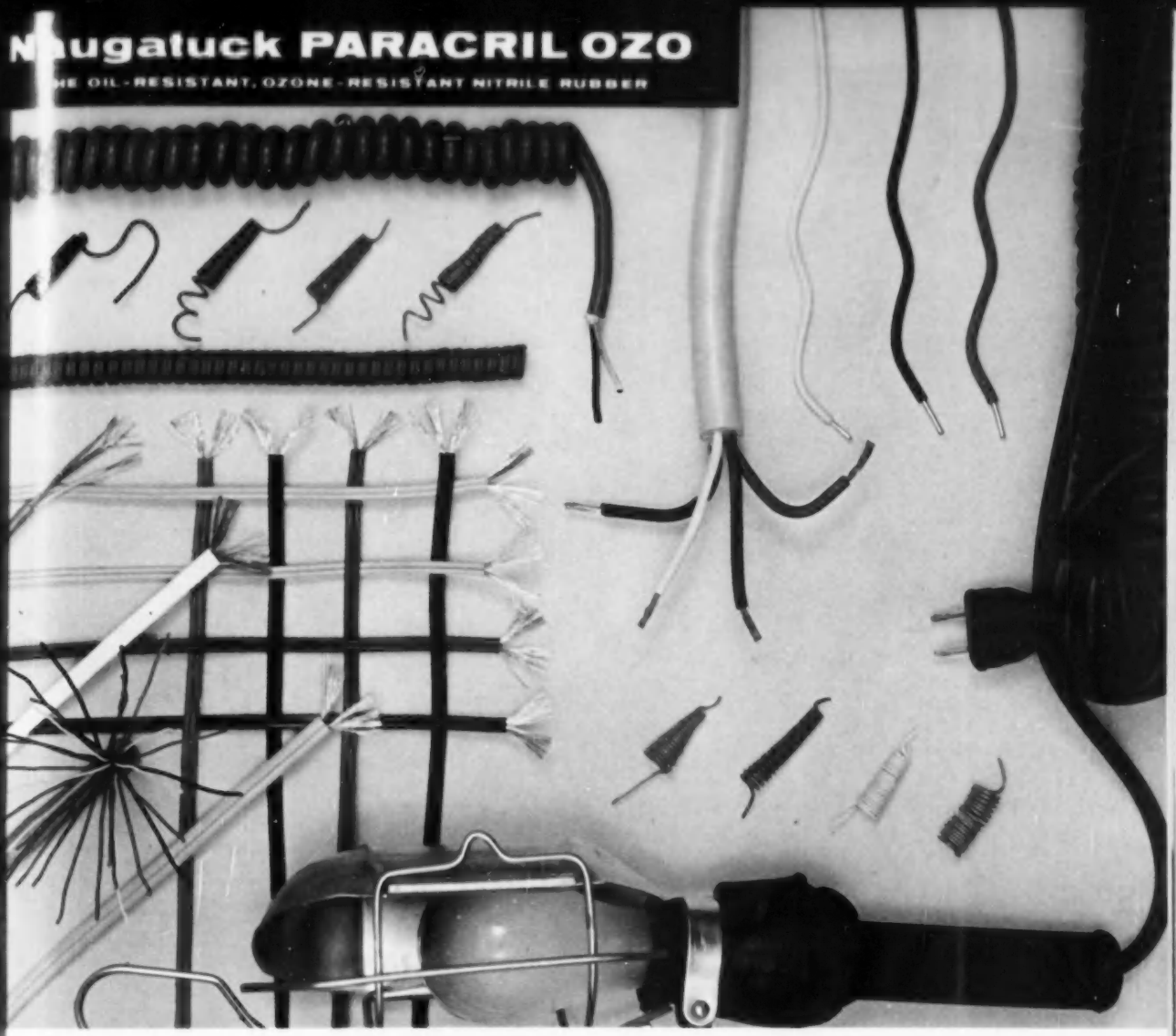
HE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER



Great new advance in wire jacket rubber

Now you can give your wire and cable jacketing new resistance to cuts and abrasion, superior resistance to attack by oils and solvents, outstanding new resistance to weather and ozone . . . *and enjoy all the benefits of color, too.*

Color code for fast, unerring identification . . . color for smart, modern appearance . . . to call attention . . . to hide . . . to add solid new sales appeal. Because PARACRIL® OZO takes and retains any color you desire, permanently.

In addition to color, PARACRIL OZO offers such advantages as:

- significantly superior ozone resistance
- excellent resistance to fuels, oils, and solvents
- exceptional abrasion resistance
- high physical properties
- good flame resistance

Try new PARACRIL OZO. See why it offers makers and users of not only wire and cable jackets, but of rubber products by the hundreds a host of valuable new selling possibilities. For more information, for samples, for technical assistance with a present or proposed application, contact your Naugatuck representative or the address below today.

Naugatuck Chemical

Division of United States Rubber Company Dept. A Elm Street Naugatuck, Connecticut

US RUBBER

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario · CABLE: Rubexport, N.Y.

STROMBERG

CARBURETOR

MILES-PER-GALLON

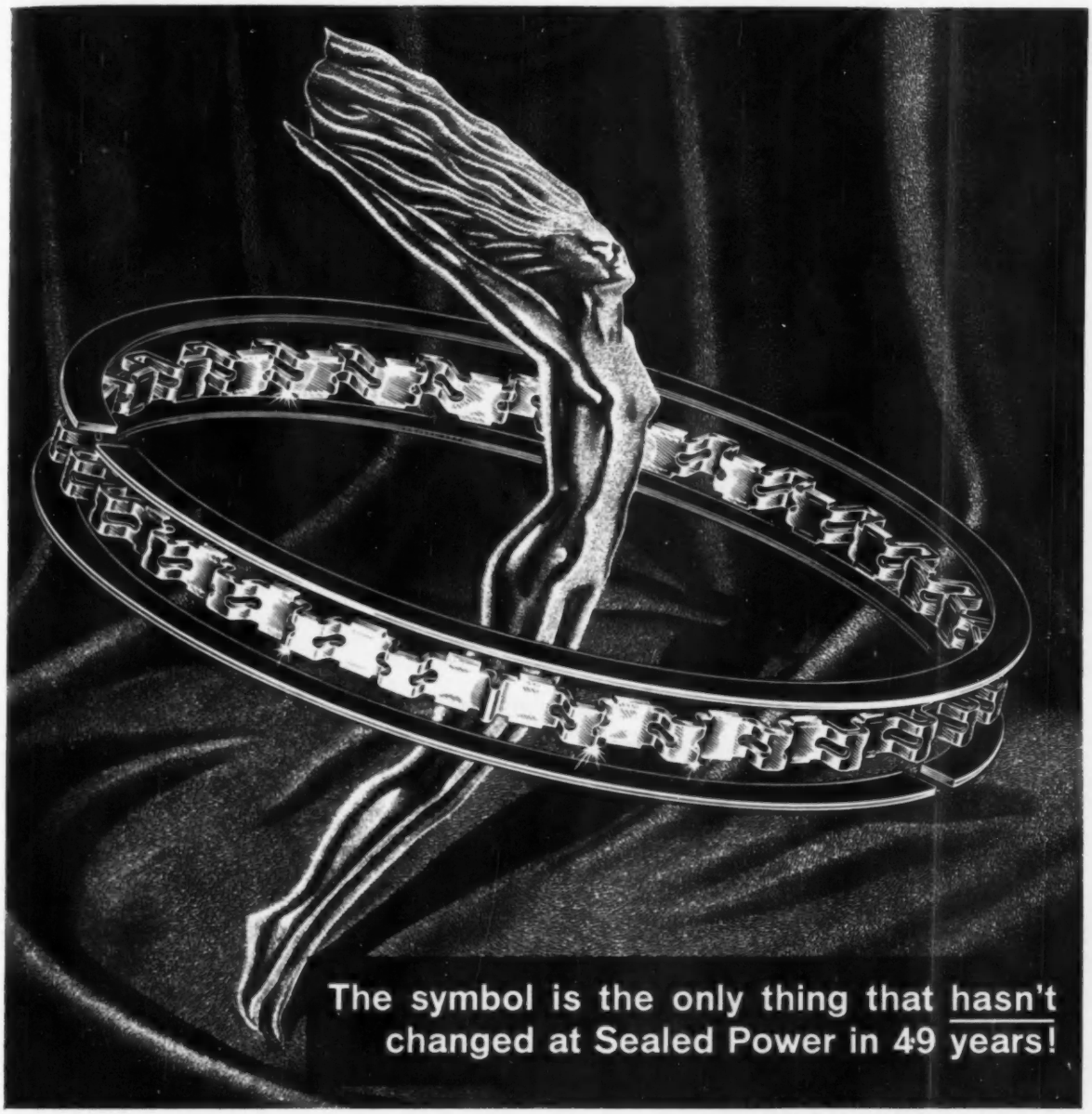
HELP TURN CUSTOMERS INTO REPEAT BUYERS

"It's a fact, repeat sales depend many times on carburetor performance. Good performance keeps the customer coming back year after year. He demands good gas mileage, easy starting, and no stalling."

"Right . . . and STROMBERG* carburetor economy, reliability, and efficiency build owner loyalty. It's a product of Bendix, and they're still the leader in automotive and aircraft fuel systems after forty years." *REG. U.S. PAT. OFF.

Bendix-Elmira
ECLIPSE MACHINE DIVISION
ELMIRA, NEW YORK

Bendix
AVIATION CORPORATION



U. S. PAT. NO. 2,789,872 STAINLESS STEEL OIL RING

Sealed Power has walked (and sometimes run) along the pathways of progress with the reciprocating engine industry for virtually 50 years.

Through one significant era of development after another our engineers, our metallurgists, and production specialists worked with engine designers.

We measure our progress in terms of our contributions to the advancing efficiency of the internal combustion engine . . . to refinements in piston ring design . . . to the high performance standards so rapidly attained in sealing and transmission rings.

Your future is our future. We look to it in this way.

Our research programs, the talents of our engineers, the forward steps in manufacturing—all these are presently, and will continue to be, dedicated to our common cause.

Sealed Power

Preferred Performance

SEALED POWER CORPORATION, MUSKEGON, MICHIGAN • ST. JOHNS, MICHIGAN • ROCHESTER, INDIANA • STRATFORD, ONTARIO • DETROIT OFFICE • 7-236 GENERAL MOTORS BUILDING • PHONE TRINITY 1-3440

PISTONS • PISTON RINGS • SLEEVES • SLEEVE ASSEMBLIES • SEALING RINGS FOR ALL APPLICATIONS

Advances in Automatic Controls Highlighted in Machine Tool Conference

(*Continued from page* 65)

to open and disconnect the power to the motor. Then, after the winding cools about 15 C, the motor can be re-started by pressing the start button.

The setup can be arranged to give an alarm by lighted lamp, in which case thermistors of lower critical temperatures are used.

Automatic Controls

In a presentation entitled "Progress in Industrial Automation," W. R. Harris, manager, Industrial Engineering Dept., Westinghouse Electric Corp., outlined the developments for automatic control of machine tools and processing.

Of particular interest here is that plans are under way for the use of in-line computers for performing complex logical processes in the productive sequence. It was indicated that three of these "sophisticated" controls were on order for rolling mill operations, and that the initial one was scheduled for completion this year.

Electrical-Discharge Machining

C. B. Minturn, manager of Electrojet Dept., Cincinnati Milling and Grinding Machines, Inc., in discussing electrical discharge machining, pointed to the growth in usage of this type of equipment. Starting with about 1000 units now installed, he predicted this number will increase by about 250 units during 1960, with a 20 or 30 per cent increase per year after that. He also pointed out that major improvements had been made in the equipment during the past few years, and that companies "should take a look at today's equipment."

Electrolytic Machining

Lynn A. Williams, president of Anocut Engineering Co., reviewed developments in electrolytic machining.

The latest one is electrolytic cavity-sinking using an electrode which is hollow so that the electrolyte can be pumped through openings in the electrode. Then as electric current passes through the brine electrolyte, the work is eaten away. He stated that equipment of this type has a removal capacity of 18 cu in. per hour.

Plant Design

Layout of the AMC plant at Kenosha, Wis., was detailed by Charles E. Pflug, plant engineer, American Motors Corp. Essentially, he reviewed the various stages of plant design, including process determination, production layout, building design, and equipment design, in setting up the complete factory operation.

Press Drives

Adjustable-speed drives have added flexibility and versatility to blanking presses, according to J. F. Ladd, electrical foreman, Plant En-

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- PRECISE WORKMANSHIP
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In addition these advantages have influenced prominent machine tool builders to specify Seibert Holding Tools when tooling up machines being furnished to mass-production plants. They know from experience that Seibert Tools will meet the most exacting requirements of their customers.

Improved machining and other production methods make possible the quantity manufacture of these production tools to precise tolerances from fine alloy steel without increased cost to the user. In addition, this efficient production provides for meeting the needs of the user with unusual promptness.

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As a result, down-time for the cab, from start of repair job until parts were ready for painting, was a **cost-saving four hours.** This is another major advantage which MOLDED FIBER GLASS offers your products . . . besides light weight, high strength, no rust, corrosion resistance, easy moldability to modern designs, beauty and economy.

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gineering Dept., Pontiac Motor Div., GMC. In his talk he predicted expanded use of adjustable-speed press drives on automotive production-line operations—with further developments in automatic mechanical handling equipment for large panels, sliding bolster presses, two-way presses, and quick-change-die presses having electromagnetic anchoring of dies. ■

AUTOMOTIVE INDUSTRIES
KEEPS YOU INFORMED

Reliability Program at Buick

(*Continued from page* 61)

building near final assembly line.

Although each of the test facilities will be operated by the quality group, cooperation will be requested from engineering or manufacturing when needed.

As mentioned earlier, the entire program should be in full effect before the '61 line is ready to roll. Since volume is usually small during the start of production, it is anticipated that the reliability group will be able to test engines, transmissions, and complete cars 100 per cent.

Having described the bare essentials of the set-up, let us consider how reliability is expected to operate more in detail. What we are doing is expanding on the four phases outlined earlier.

For the design phase: the reliability group undertakes a review of preliminary design and of detail design. Out of this will come a reliability prediction in terms of numbers for each critical component. Consider that there will be a minimum acceptable value of reliability. If a part is judged to be at a lower value it is discussed with engineering. If there is agreement on both sides, it will probably result in some redesign of the part. After this has been done, the reliability group revises its prediction and the situation is satisfied if the final prediction comes within the minimum value.

For the test phase: the group makes a study of the test procedure and equipment; follows prototype testing; and makes an evaluation of test results. If test results indicate that a given part or assembly does not meet requirements, the matter is discussed with engineering and may result in a redesign or some suitable change. Once again the engineering change is evaluated and is assigned a revised predicted reliability value.

For the production phase: the group conducts production tests and their evaluation. As before, if the predicted value of reliability has not been met, there is a design review and charge, followed by a new predicted value which has to be acceptable.

In the customer service phase, the group works with the dealers and field service to evaluate field failures and problems. This must be followed by corrective action which may be a change in design or in quality control. After cor-

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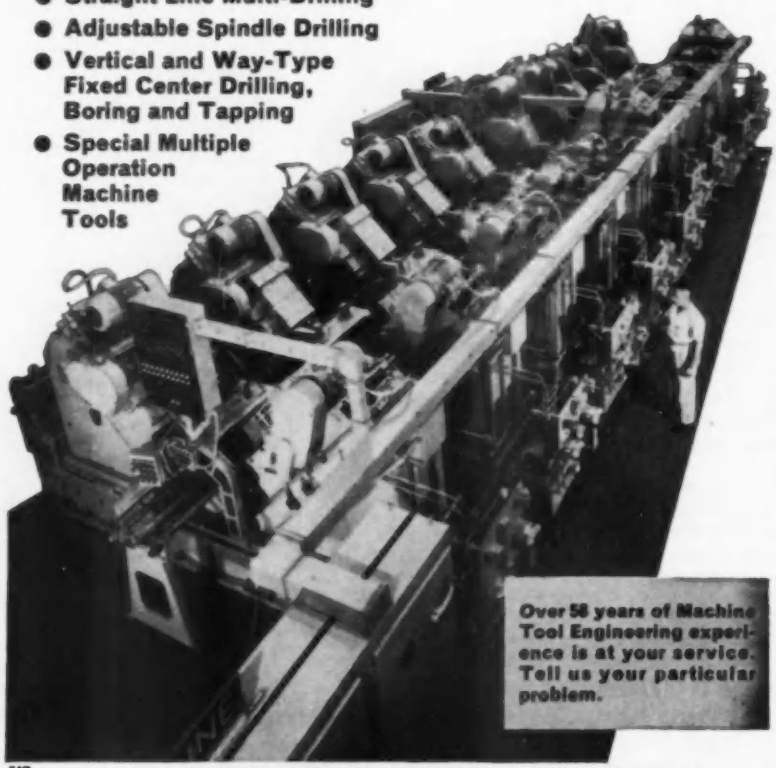

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Twenty-Station, Ten-Unit Transfer Machine for boring, counterboring, chamfering and valve clearance operations on V-8 automotive engine blocks. (Shown above)

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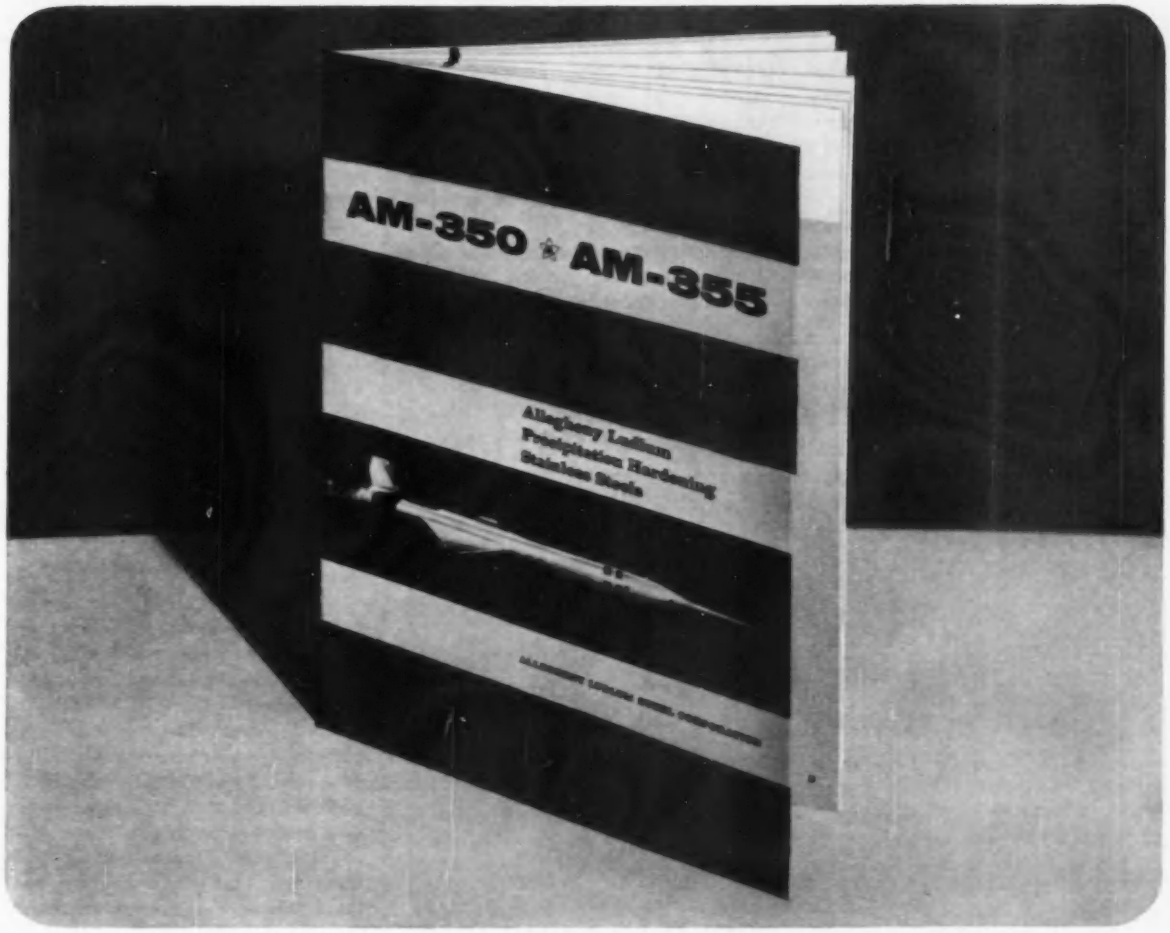

New booklet on A-L's precipitation-hardening stainless steels, AM-350 and AM-355

A tool for anyone interested in high strength-to-weight metals

In this technical booklet, you get the facts on Allegheny Ludlum's precipitation hardening stainless steels, AM-350 and AM-355, metals developed for space age requirements.

AM-350 and AM-355 combine these unusual qualities. They are easy to fabricate. Have high strength-to-weight ratios at room and elevated temperatures combined with excellent resistance to corrosion.

The physical and mechanical properties of the two metals are described in 33 charts and tables. Included are heat-treatment and fabrication data, eight photomicrographs and a section on corrosion resistance with representative values in selected environments.

It's jam-packed with data. For your free copy, see your A-L representative or write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pa. Address Dept. AI-5.*

***

ALLEGHENY LUDLUM

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Circle 162 on Inquiry Card for more data

rective action has been made, the group again evaluates the correction and revises its prediction.

Even this brief summary makes clear that reliability penetrates every phase of the operation, enlisting the cooperation of engineering, research, metallurgy, manufacturing, purchasing, and service.

One thing is clear; the quality control group functions as before in a constant watch on the manufacture of every single piece that goes into the car. The only change is that quality control now becomes one of the facets of a larger and more comprehensive scheme of things. In fact, this group can function even better than before since it will have larger scope, better facilities, and above everything—surer communication in its efforts to achieve better control.

Finally, we have reproduced a small organization chart showing the composition of the reliability division. It will be noted that the head of the group is the **Director of Reliability and Quality Control.** Working with him are Directors, respectively of reliability and quality control. Committee action on all important problems is achieved through the Reliability Committee, as shown. This group has the final word on problems and action and changes, subject only to the mediation of the General Manager of the division. ■

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Over 30 years of specialization and engineering research have produced a radiator and core proved dependable under all conditions.

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Automotive AIR CONDITIONER SALES

(*Continued from page* 108)

future. Equipment manufacturers are committed to increasing efficiency, reducing costs and decreasing weight.

Spot coolers are in for a big play. Supplementing the main system, they will provide maximum cool air control for the driver's own personal comfort.

Dual units, incorporating both air conditioning and heating systems will be available as an option on most all new cars.

Freezing of the evaporator coil is now just a memory. New regulator valves and electric sensing devices automatically declutch the compressor when it approaches freeze-up temperature.

New and lighter materials coupled with functional redesigns will give evaporator cabinets a more integral appearance.

The key that will open the door to the mass market is cost. It is still a little too steep for the benefits obtained. Producers, working under the old law of supply and demand, are fighting to nail down costs against pay-as-you-go production schedules. Crash programs to develop new materials, methods and control costs will, however, do much to accelerate this industry which is already characterized by phenomenal growth.

No longer the stepchild of the luxury equipment market, automotive air conditioning has a long term lease on the future. ■

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...pilot operated control valves

• Built to JIC standards • interchangeable pilots • choice of mounting types, optional features • ac or dc, any voltage • ¼ to 1 in. NPT

SPEED KING solenoid pilot coils, potted in molded resin, are unconditionally guaranteed against coil burnout for the life of the valve! And, Speed King pilots are totally enclosed, and sealed against entrance of dirt or moisture . . . valves are fully air-operated for speed and dependability . . . feature a hard-chrome plated stainless steel plunger floating in O-rings, to eliminate wear-producing metal-to-metal contact.

For multi-million cycle dependability, specify Valvair® SPEED KING control valves.

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DIVISIONS OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

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THIS IS DU PONT DELRIN®

a new engineering material offering the user distinct performance and cost advantages in many products once reserved for metals

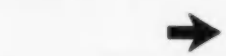
In "Delrin" acetal resin, automotive engineers now have a new engineering material that offers distinct performance and cost advantages in many components now made of die-cast zinc and aluminum, cast and machined brass, stainless steel and cast iron.

The unique combination of physical properties and production economies offered by "Delrin" has already led to its use for many components on 1960 models, including windshield washer pumps, steering knuckle bushings, radio and dimmer switch parts.

The table on the following page summarizes the properties of "Delrin" as they relate to various projected automotive applications. All these desirable properties are retained to a remarkable degree even under exposure to wide temperature extremes, high humidity, solvents and stress.

In addition, automotive components can be economically mass-produced in "Delrin" via injection molding and extrusion . . . frequently in one-piece, integral shapes requiring no finishing operation. Parts may be joined by mechanical fasteners, spin welds or snap fittings. Production molds assure part-to-part uniformity. Products can be surface-textured, painted, vacuum-metalized or made in integral colors.

We suggest you investigate the opportunities for improved design and lower cost that "Delrin" offers you. Commercial processors and Du Pont's Automotive Plastics Consultants Group (located in Detroit) are ready to assist you. Simply mail the coupon on the right.



This chart summarizes information obtained from extensive laboratory and field test programs. It matches possible automotive applications to known properties of "Delrin", affording you the starting point for evaluation of this new material.

PROPERTIES OF "DELRIN"		INTERIOR HARDWARE (Door Handles, Window Cranks)	BUSHINGS & BEARINGS (Suspension Systems & Steering Linkages & Door Hinges)	SQUIRREL CAGE BLOWERS (for Heaters & Air Conditioners)	GEARS	MECHANICAL CABLE CASINGS (Push-Pull & Rotary)	INSTRUMENT HOUSINGS	WINDSHIELD WIPER (Pivots or Transmission Housings)	FUEL SYSTEMS (Pump and Carburetor Parts)	ELECTRICAL COMPONENTS (Bulb Sockets, Switch Housings & Toggles)
Tensile Strength	(ASTM D638): 10,000 psi at 73°F. 4,000 psi at 250°F.	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiffness	(ASTM D790): 410,000 psi at 73°F. 90,000 psi at 250°F.	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dimensional Stability: Load	0.5% Def. under 2,000 psi load at 122°F. (ASTM D621): 338° F. Heat Dist. Temp. at 66 psi (ASTM D648)		✓	✓	✓	✓	✓	✓	✓	✓
Dimensional Stability: Creep Resistance	0.4% Deformation at 113°F. and 10,000 hrs. under 500 psi load		✓	✓	✓		✓	✓	✓	✓
Dimensional Stability: Environmental	Linear Change +0.1% going from 0 to 50% RH +0.4% going from 0% RH to Saturation +0.1% in gasoline		✓		✓	✓	✓	✓	✓	✓
Solvent Resistance	Weight Change +0.3% in Gasoline at 73°F. +0.9% in Brake Fluid at 158°F. —0.2% in "Unifio" at 158°F. +1.9% in Ethanol at 122°F. 0.0% in Kerosene at 140°F.		✓		✓	✓		✓	✓	✓
Toughness	Fatigue Endurance: 5,000 psi at 73°F. Impact (Izod— ASTM D256) 1.2 ft. lbs./in. at —40°F. 1.4 ft. lbs./in. at 250°F.	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bearing Properties	No Slip Stick No Squeak Coeff. of Friction on steel 0.2 vs. 0.1 Dry 0.08 Lubricated	✓	✓			✓	✓	✓	✓	✓
Excellent Appearance	Colorability High Gloss Paintability	✓					✓		✓	✓
Serviceability	Wear Resistance Mar Resistance Stain Resistance Corrosion Resistance	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fabricability	Injection Molding Extrusion Machining	✓	✓	✓	✓	✓	✓	✓	✓	✓
Electrical Properties	(ASTM D150): Dielectric Constant: 3.7 Dissipation Factor: .004 at 73°F. from 10^2 to 10^6 cps						✓		✓	✓

POLYCHEMICALS DEPARTMENT

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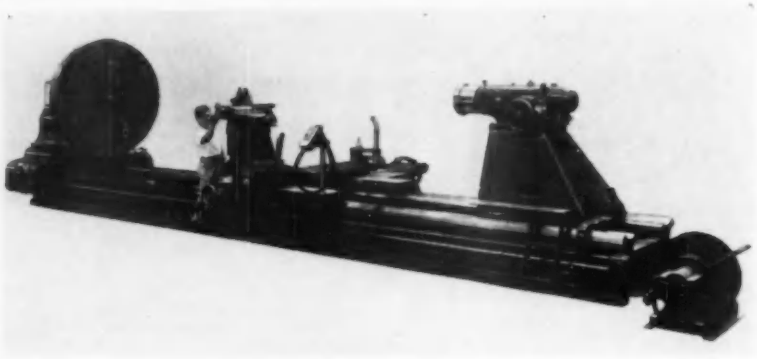
 Continued from page 94



New giant lathe available in several different sizes

Newly Designed Engine and Tracer Lathe

THE Maxi-Swing lathe is a completely new engine and tracer lathe that has been designed for heavy work loads up to forty tons, and will make precision cuts to a ¾-in. depth. It is available in four sizes with swings from 74 to 108 in. over the bed. The bed is 56 in. wide with four hardened and ground replaceable veeways. The tracer lathe is completely equipped with carriage mounted power unit and motor, all hoses and fittings, hydraulic tracer valve, angle tracer slide with hydraulic actuating cylinder, periscope-type precision optical viewer, template holder brackets and adjustable supports for flat templates.

Internal geared face plate drive, pendant controlled operation including apron feed clutches, 7½ in. diameter tail stock spindle, and traveling operator platform, are standard equipment for either engine or tracer lathe. *The American Tool Works Co.*

Circle 54 on postcard for more data

Portable Press

OCCUPYING a space of 10 by 13 in. this new press has a 4 in. stroke,

1 in. ram and 5½ in. throat. Weighing 150 lb, it is complete with a ¾ hp motor that operates on 110 V and 60 C current. For high production applications it is provided with automatic control features to synchronize with any machine tool or production line. To provide unlimited throat dimension, this press is supplied without base but with mounting lugs for secure positioning where desired. *John S. Barnes Corp.*

Circle 55 on postcard for more data

Hardness Testing Machine

A NEW metal hardness testing machine incorporates a direct reading Brinell hardness gauge.

By combining accurate, foolproof load application with simultaneous

read out of Brinell hardness level, the direct reading Air-O-Brinell machine provides speed and accuracy for production line hardness testing.

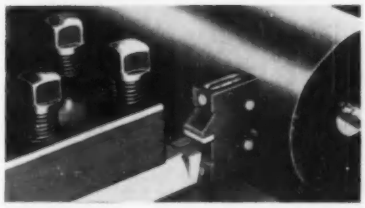
Positive load application is assured, since the pressure gauge at the top of the unit, graduated in kilograms of Brinell load, shows the exact pressure that will be applied before the test is made. To use the device the operator adjusts the air pressure regulator valve until the desired load is indicated on the gauge. Once the load is set, any number of hardness tests can be made in rapid sequence. The special design of the unit assures uniform test load application. *Tinius Olsen Testing Machine Co.*

Circle 56 on postcard for more data

Tool Centering Gage

A FAST and accurate method of setting lathe-type cutting tools to the work centerline is made possible by the new tru-center gage.

A machined aluminum body attaches itself to the cylindrical work piece with cylindrical precision locators which are magnetized by ceramic magnets inset in the body and in contact with the locators. If the work piece is of non-magnetic material, such as aluminum or brass, the gage may be held in place with a neoprene rubber band.



A spirit level is inset in both edges which enables the gage to be positioned to a degree of accuracy which can be measured in ten-thousandths of an inch, thus enabling the lathe tool to be positioned either on the exact centerline or to a known amount above or below the centerline as desired.

Imbedded in the forward edge of the gage is a wear pad (anvil) which rests on top of the cutting edge of the tool so that actual machining cannot take place other than the exact point which the gage indicates. A chart is furnished which translates the spirit-level graduations into thousandths of an inch, either above or below the centerline as desired. *Tru-Center Products Co.*

Circle 57 on postcard for more data

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Consistent quality in mass production is a McQuay-Norris specialty. Our standards are the finest you'll find in the industry. We welcome the opportunity to work with your design engineers. Call us for your ring requirements.

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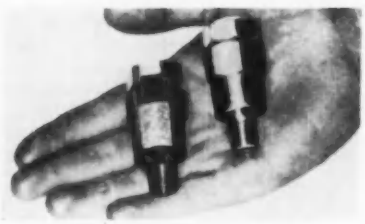
RINGS IN THE INDUSTRY

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly
ASSISTANT EDITOR



LP Gas Filter

A new filter, for use on LP gas systems, has been designed with a replaceable textile filter element. Named the model 1117-2, it measures 2½ by 1⅛ in., and is reported to be suitable for most small LP engine conversions on fork lift trucks, farm equipment, trucks and contractor's machines.

These filters are made from hex, brass bar stock and have a ¼ in. MPT inlet, and a ¼ in. FPT outlet. The filter cartridge will trap elements as fine as five microns in size. *Wilkerson Corp.*

Circle 40 on postcard for more data

Mist Generator

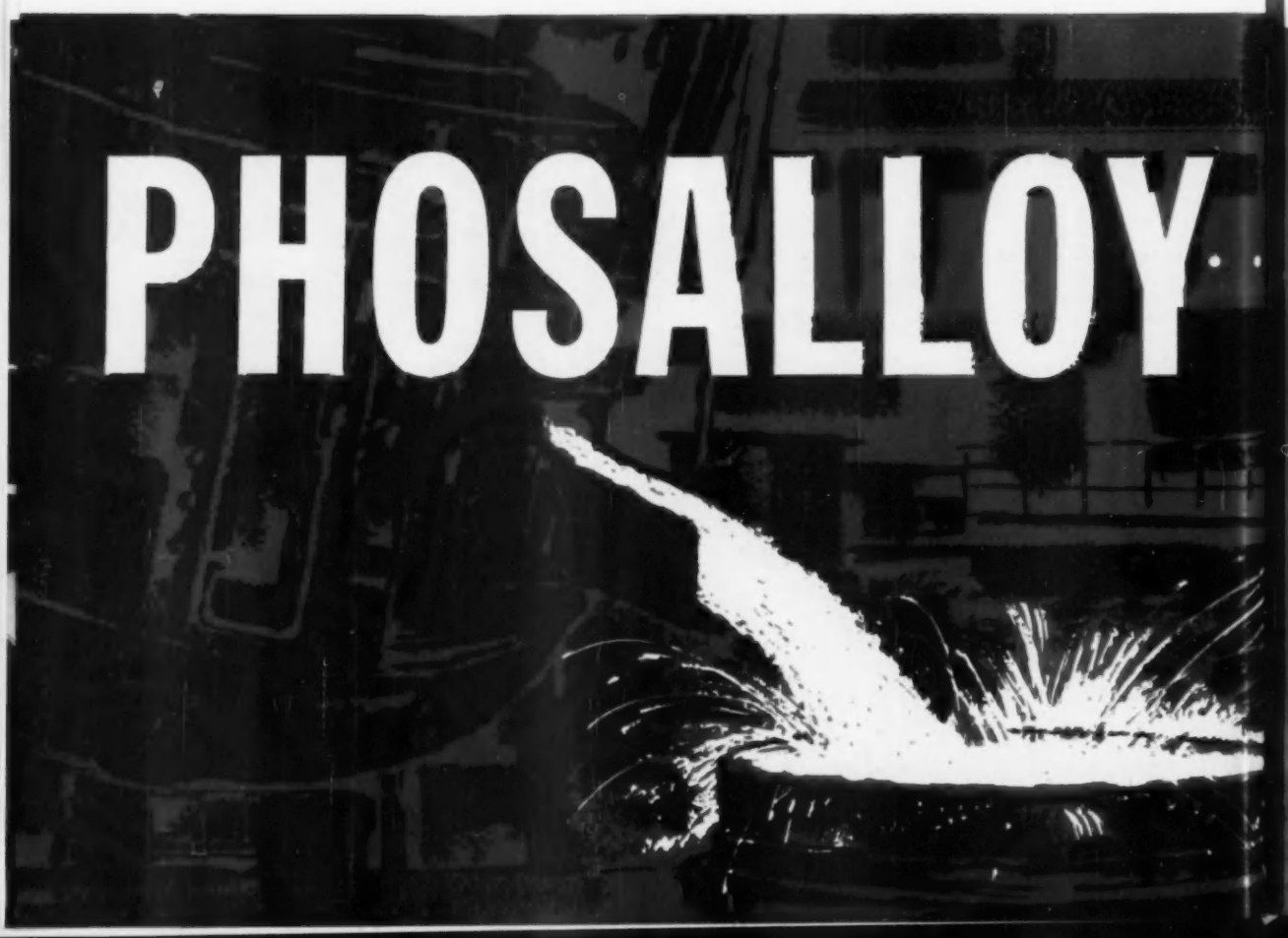
MODEL D-60, mist coolant generator, is designed for use on drill presses having 2¾ in. columns. Air and coolant is controlled automatically by the up and downward movement of the drill press spindle. In addition to an on-off control, needle valves permit precision air and coolant flow, set to meet the job requirements. The exclusive universal joint nozzle holder permits easy nozzle setting. *Aetna Mfg. Co.*

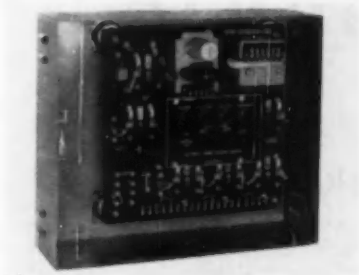
Circle 41 on postcard for more data

Heat Proof Coating

A new coating has been designed to cover many surfaces that had previously been regarded as too hot to paint. This new development is applicable to metal components subject to heat ranges of 600 deg to as high as 1700 deg. Named Heat-Rem 170, it contains a combination of non-leafing aluminum and a special metallic pigment. It also comes in a variety of colors to allow color coding. *Speco, Inc.*

Circle 42 on postcard for more data





Engine Starting Control

A new automatic engine starting control, intended for fully automatic starting and stopping of engine driven generating sets has been introduced. This unit features positive prevention of recranking at full engine speed and was designed to respond at 50 pct of normal battery voltage. It will operate over a broad ambient temperature range and contains industrial control type components throughout. *Automatic Switch Co.*

Circle 43 on postcard for more data

Polishing Heads

A new line of polishing heads are available in abrasive face widths of 1, 2, 4, and 6 in. These new, 16 brush polishing heads can be employed in the production line as well as maintenance operations. They can be supplied with brush holders made from both Cadmium and hard chrome plate. *Grinding and Polishing Machinery Corp.*

Circle 44 on postcard for more data

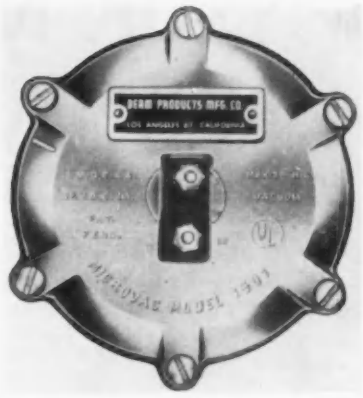
New Packaging Cord

A new packaging cord strapping, named Avistrap, is reported by the manufacturer to offer entirely new advantages in packaging operations. It is made of high-tenacity rayon cord, and weighs considerably less than some other types of strap used for packaging. *Industrial Packaging Dept., American Viscose Corp.*

Circle 45 on postcard for more data

Vacuum Safety Switch

A new vacuum safety switch is now being furnished with automotive type terminals and is designed for use with all LP-Gas Systems. The unit features a miniature micro switch



with contact points which have a positive snap action, enclosed to prevent arcing. The Microvac is wired in series with the LP-gas solenoid valve as a safety measure to open the solenoid valve circuit. This insures positive fuel shut-off whenever the engine stops. Housing is aluminum die-cast with vacuum connection on side opposite terminals for accessibility to wiring. Switch is set at the factory to close between 1 and 1.5 in. of water column and is suitable for many different applications. *Beam Products Mfg. Co.*

Circle 46 on postcard for more data

. . . . an exclusive feature of

McQUAY-NORRIS

Electric furnace phosalloy—a development of McQUAY-NORRIS—is a superior metal created to give rings unusual toughness and tension retaining qualities. Rings made of phosalloy stand out because they stand up! . . . Our engineers will be glad to tell you more about it. Give us a ring.

A BETTER METAL FOR BETTER RINGS

McQUAY-NORRIS MANUFACTURING CO.
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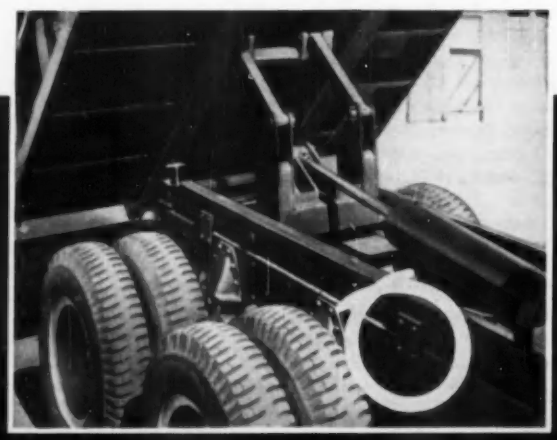
NYLOK NUTS GRAB HOLD... LOCK TIGHT

Vibration and heavy loads can't shake them loose

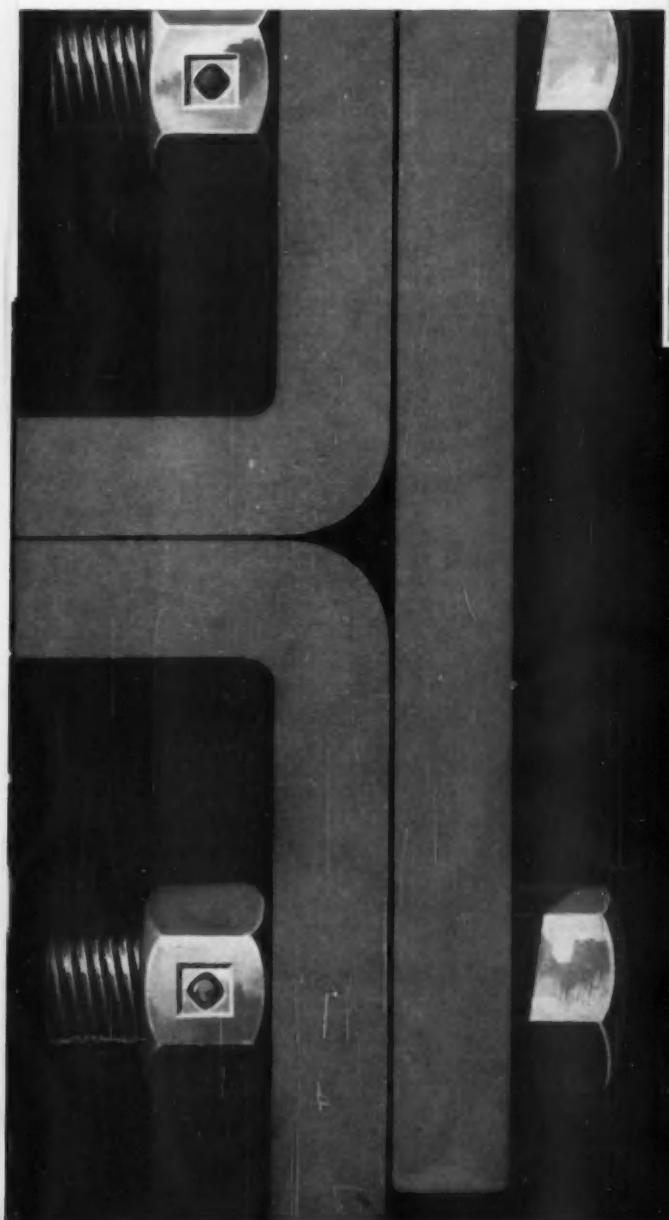
Put tons of load in a dump body, hoist it up, slam it down. Drive the truck over rough, jarring terrain. Still Republic NYLOK® Nuts hold tight—grip with a positive lock to anchor Heil Dump Bodies to the chassis as one solid unit.

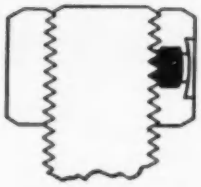
NYLOK Nuts stay tight in any position—seated or not. They're easy to apply manually or automatically. Can be used over and over.

Check your products for applications where NYLOK Nuts can do the job better, save you money. Then contact your Republic Distributor. Mail coupon for more data.



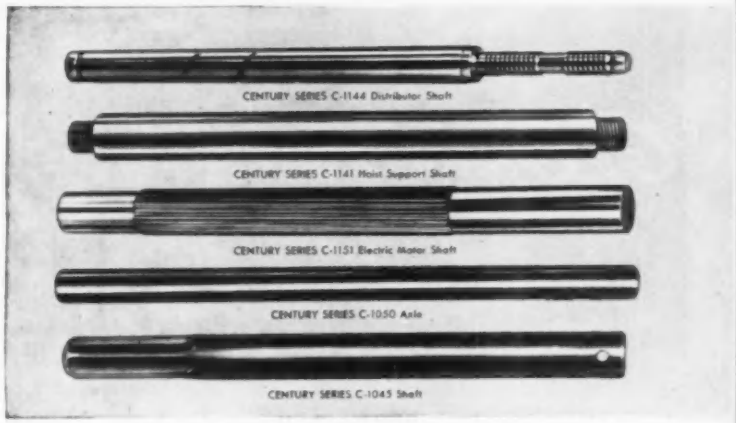
Dump body by Heil Company, Milwaukee, Wisconsin. Unit is anchored to the chassis by 16 Republic NYLOK Nuts.



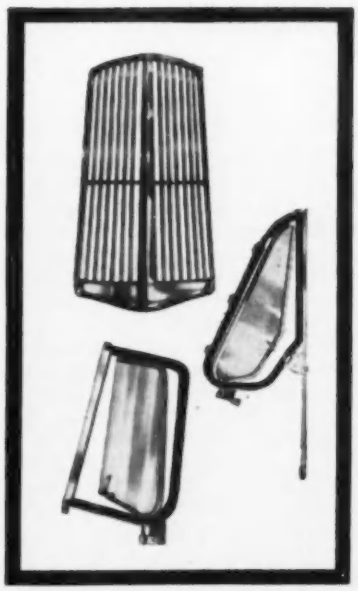


HERE'S HOW NYLOK WORKS

A nylon plug firmly staked into one of the faces of the cold forged hex nut forces a tight, metal to metal contact of opposite mating threads for vibration-proof lock.


CENTURY SERIES C-1144 Distributor Shaft
CENTURY SERIES C-1141 Hoist Support Shaft
CENTURY SERIES C-1151 Electric Motor Shaft
CENTURY SERIES C-1050 Axle
CENTURY SERIES C-1045 Shaft

REPUBLIC'S CENTURY SERIES is a family of five grades of cold finished, specially processed, stress-relieved bars—all having minimum yield strength of 100,000 psi. The series is designed to meet exact requirements of steel parts producers requiring high strength, varying degrees of machinability. Republic Metallurgists and Machining Specialists are available to work with you in selecting the right grade for your application. Mail coupon for free Century Series booklet.



HIGH STRENGTH-TO-WEIGHT RATIO of Republic Stainless Steel permits the use of slimmer channels and frames in passenger car and truck sash. Protected by stainless, glass breakage is less likely. Strength, dent-resistance, and corrosion-resistance make stainless ideal for radiator grills. Manufacturer—Excel Corporation, Elkhart, Indiana.

POWER TAKE OFF COUNTER-SHAFTS cost Ford Tractor Division less to produce using Republic Die-Form Blanks, as compared with previous materials. Minimum machining is required, handling costs and scrap loss are reduced. Pictured are the blank and completed shaft. Clip and send the coupon for information on the savings potential of Republic Die-Form in your operations.

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World's Widest Range of Standard Steels and Steel Products

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Please send more information on:

☐ Stainless Steel ☐ Die-Form ☐ NYLOK Fasteners
☐ Please send Century Series Booklet

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

FOR CUSTOM COMPOUNDED PRECISION FABRICATED

Go Goshen RUBBER

PARTS
SEALS
PRODUCTS

O-RINGS

TO MEET ADVANCED REQUIREMENTS

Capitalize on Goshen's experience in serving the needs of hundreds of large and small users of o-rings in the United States and Canada. Precise control of quality thru every stage of formulation and manufacture is the key to an outstanding record of sealing success.

GRC o-rings in all standard AN, MS, SAE and JIC sizes, in many non-standard sizes and in special sizes, are available from established and proven synthetic and silicone specification compounds. Go Goshen for efficient sealing under most any given conditions.

Ask for your free copy of 16-page O-ring Brochure on size, groove dimensions, compounds and other helpful information.

Goshen Rubber Co., INC.

2750 S. TENTH STREET GOSHEN, INDIANA

Manufacturers' News

Borg-Warner to Spend $34 Million

Borg-Warner Corp. plans to invest a record $34 million in new facilities, machinery and equipment in the U. S. and foreign countries in 1960, Roy C. Ingersoll, chairman, announced. The figure represents a 72 per cent increase over the $19.7 million spent in 1959. Eight Borg-Warner divisions and subsidiaries will figure in the expansion plans, Mr. Ingersoll said. He added that while the business outlook is not as favorable as it appeared several months ago, he had reason to believe B-W will still have one of its best years. The company had record sales and near-record earnings last year. Sales were $649.8 million as compared with $533 million in 1958, an increase of 21.9 per cent. Net income totaled $39.3 million, equal to $4.36 a share as compared with $21.1 million or $2.34 a share, in 1958, a gain of 86 per cent.

Perfect Circle Had Record Net

Perfect Circle Corp. achieved a 30 per cent gain in sales and an 80 per cent rise in earnings in 1959 for all-time records. Net sales amounted to $40.1 million as compared with $30.7 million in 1958. Earnings were $3.8 million, or $3.37 a share as compared with $2.1 million or $1.87 a share in 1958. Don H. Teetor, chairman, told stockholders Perfect Circle enlarged its international operations last year and is expanding other facilities. The sleeve castings plant at Richmond, Ind., will have increased its floor space by 62,000 ft. A new foundry at Rushville, Ind., will be completed this year. Mr. Teetor said international growth included purchase of Platka Export, Inc., of Ft. Wayne, Ind., formation of a distribution subsidiary in Holland to serve Europe's Common Market, and establishment of a manufacturing plant in Mexico.

Sun Oil's Income Up

Sun Oil Co. has reported 1959 revenues of $746 million in 1959 as compared with $724 million in 1958. The net income, $42.8 million, was equal to $3.48 a share. The 1958 income, $32 million, was equal to $2.73 a share. Joseph N. Pew, Jr., board chairman, reported net earnings increased 34 per cent on a three per cent rise in dollar volume of business in 1959. This reflected concentrated efforts to reduce unit costs of all operations and the fruits of prior year investments in expansion, Mr. Pew told stockholders.

Goodrich Plans New Factory

B. F. Goodrich Co. will construct a multi-million dollar tire manufacturing plant near Ft. Wayne, Ind. In full operation, it is expected to employ about 1,000. Planned to meet anticipated expansion of the tire market during the next five years, the plant will produce most types and sizes of passenger car, truck and farm implement tires.

Solve Your Adjustable Speed Problems with this Combination

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DYNAMATIC®
DIVISION
EATON MANUFACTURING COMPANY
KENOSHA · WISCONSIN

AJUSTO-SPEDE*®

If your problem is in the field of speed control, tension control, power transmission, or testing, Dynamatic Eddy-Current Equipment is the ideal solution. Dynamatic Ajusto-Spede Drives, Couplings, Brakes, and Dynamometers are solving these problems in virtually every industry—in both plant machinery and end product applications. Dynamatic equipment can do the same for you.

Ajusto-Spede Drives and other Dynamatic units offer the important advantages of rapid response, wide speed range, quiet operation, low power loss, low maintenance costs, and stepless adjustable speeds from an AC power source.

For complete information about Dynamatic problem-solving equipment, check with your local Eaton-Dynamatic representative or distributor.

The New Quill-Type Ajusto-Spede Drive provides controlled adjustable speeds for applications from ½ HP through 7½ HP. Together with the new K-2 Electronic Control and push-button station, this new Ajusto-Spede Drive comprises a compact, low-cost, 3-unit drive package.

Send for Illustrated Descriptive Literature Covering New Models ACM-903 and 904 Ajusto-Spede Drives

Red tint indicates adjustable speed member.

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*When You See the Name Ajusto-Spede You Know it's an Eaton Product

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MANUFACTURING COMPANY
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PIONEER IN EDDY-CURRENT EQUIPMENT

Circle 169 on Inquiry Card for more data

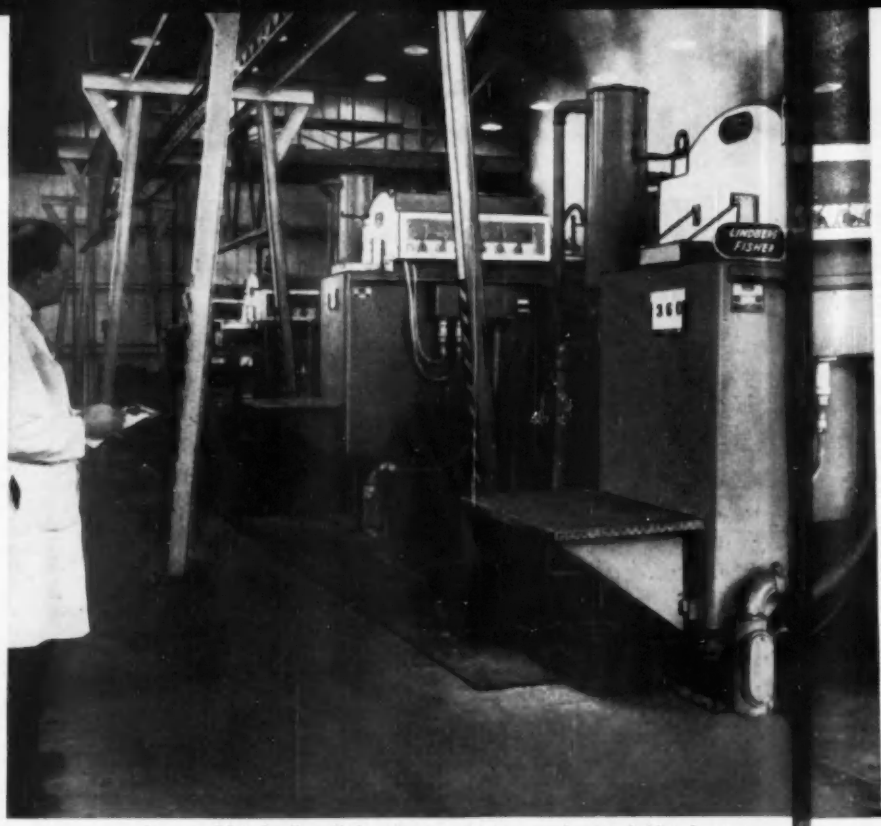
When you apply heat to aluminum Lindberg can give you the right help

If your product requires the application of heat to aluminum, you can safely look to Lindberg for the equipment and methods to do the job best. Anywhere along the line from the ingot to the finished product, Lindberg-Fisher equipment and broad experience can meet every need.

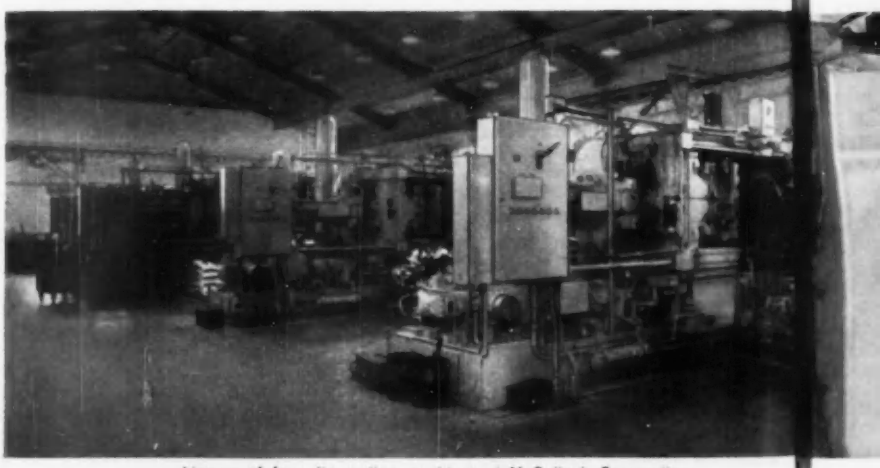
With its long-time background in all phases of heat to industry our engineering staff has standout knowledge of the hows and whys of aluminum melting, casting and treating. Over the years this staff has been responsible for many of the most important developments in the field.

For instance, the technique of putting a cast lining in induction melting furnaces to provide lower initial and maintenance cost . . . the Lindberg Autoladle, the first practical automatic ladling unit . . . the two-chamber induction melting furnace . . . and many other practical innovations. This is why our aluminum processing experts, such as Ray Dunn are frequently consulted in an advisory capacity on aluminum treating problems.

Since we cover all types of equipment for melting, holding or treating aluminum, you can depend upon us to recommend objectively the most suitable procedures and equipment to fit your requirements. Get in touch with your local Lindberg Field Engineer (see your classified phone directory) or write direct to: Lindberg-Fisher Division, Lindberg Engineering Company 2491 West Hubbard St., Chicago 12, Ill.



Line-up of four Lindberg-Fisher electric resistance reverberatory holding furnaces at McCulloch Corporation. Die casting machines are just behind each furnace.

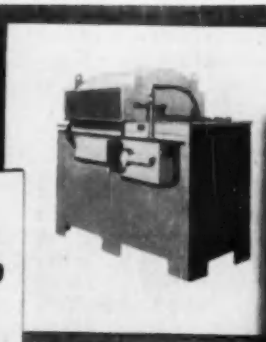


Line-up of four die casting machines at McCulloch Corporation. Lindberg-Fisher Holding Furnaces are just behind each machine.

THERE'S LINDBERG EQUIPMENT FOR EVERY INDUSTRIAL NEED

These are representative units from complete Lindberg lines in all types of industrial heating equipment.

The Lindberg Autoladle



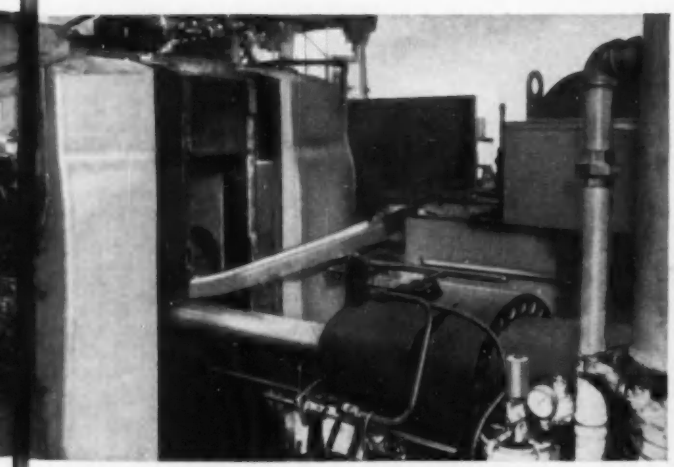
Electric Resistance Aluminum Holding Furnace

Cyclone Heat Treating Furnace

THE RIGHT COMBINATION FOR DIE CASTING EFFICIENCY...LINDBERG FURNACES AND AUTOMATIC LADLING

Die casting efficiency at the McCulloch Corporation, Los Angeles, California, has been gratifyingly increased with the new installation of four Lindberg Electric Resistance Reverberatory Holding Furnaces equipped with Lindberg's automatic ladling unit, the Autoladle. These holding furnaces, with 2000 lbs. molten aluminum capacity, are spotted adjacent to four die casting machines. Molten aluminum is delivered to the furnaces by monorail and held at the precise temperature required by the casting station. The precise shot is delivered automatically to the die casting machine by the Lindberg Autoladle. This installation is used primarily for casting parts for McCulloch-Scott outboard motors.

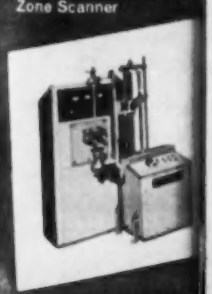
In any production process where aluminum needs heat there is Lindberg equipment to apply it most economically and efficiently, and Lindberg experience to fit this equipment most ideally to your product and production requirements. Furnaces for melting and holding, casting stations, re-melting or heat treating are available in all capacities, electric or fuel fired. Get in touch with your Lindberg Field Engineer (see your classified phone book) or write us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2491 West Hubbard St., Chicago 12, Illinois. Los Angeles Plant: 11937 South Regentview Ave., Downey, California. In Canada: Birlefco-Lindberg, Ltd., Toronto.



Precise shot of proper temperature aluminum is automatically delivered from conveniently located holding furnace to die casting machine by Lindberg Autoladle.

Housings for McCulloch-Scott outboard motors, shown here, are representative of the type of castings Lindberg equipment helps McCulloch produce.

High Frequency Unit with Zone Scanner



Large Aluminum Melting and Holding Reverb.

Laboratory Box Furnace

Periodic Ceramic Kiln

350 KW Induction Melting Furnace

More Government Contract Awards

LATEST contracts awarded by various Government agencies, and covering primarily automotive and aviation products, are listed in the following. This list is for the period Apr 5 to Apr 30, inclusive.

AIR PRODUCTS, INC., Allentown, Pa.
48 semi-trailer transporters—$1,801,632

BAKER INDUSTRIAL TRUCKS, A DIV. OF OTIS ELEVATOR CO., Cleveland, O.
Truck, fork lift, 6 ea—$141,868

BENDIX AVIATION CORP., BENDIX SYSTEM DIV., Ann Arbor, Mich.
Eagle Missile System—$21,000,000

BROWN & SHARPE MFG. CO., Providence, Rhode Island
Grinder, 2 ea—$49,510

THE CARRINGTON CO., Seattle, Wash.
Tractor and Shoes—1 ea—$23,999

CHRYSLER CORP., Detroit, Mich.
2,500 trucks—$10,856,849

CHRYSLER MOTORS CORP., GOVERNMENT SALES DEPT., Detroit, Mich.
Truck, tractor, 97 ea—$462,867

CHRYSLER CORP., Detroit, Mich.
Missile system—$1,120,000

CINCINNATI MILLING & GRINDING MACHINES, INC., Cincinnati, Ohio
Milling machines, 4 ea—$170,788

CLARK EQUIPMENT CO., INDUSTRIAL TRUCK DIV., Battle Creek, Mich.
72 fork trucks—$358,000

A. C. COLBY MACHINERY CO., INC., New York, N. Y.
Lathe, 10 ea—$19,144

CONSOLIDATED DIESEL ELECTRIC CORP., Stamford, Conn.
Truck, Tank, Aircraft Water Servicing, 51 ea—$883,649

CONTINENTAL MOTORS CORP., Muskegon, Mich.
Tank engine assemblies—$2,696,000

DORSEY TRAILER, INC., Elba, Ala.
194 semi-trailers—$1,077,149

EIDAL MFG. CO., Albuquerque, N. Mex.
Trailer, Chassis—$48,076

FORD MOTOR CO., Dearborn, Mich.
1,638 light sedans—$2,285,676

FORD MOTOR COMPANY, FORD DIV., Dearborn, Mich.
Trucks, varying types, 2777—$6,234,787

FORD MOTOR COMPANY, Chicago, Ill.
700 heavy-duty, tandem axle trucks—$8,000,000

GENERAL ELECTRIC, Schenectady, N. Y.
Helicopter gas turbine engines—$936,000

ALLISON DIV. OF GENERAL MOTORS CORP., Indianapolis, Ind.
180 transmissions and kits (tanks)—$1,792,208

GENERAL MOTORS CORP., CHEVROLET MOTOR DIV., Detroit, Mich.
Truck, 22 ea—$121,795

CHEVROLET DIV. OF GENERAL MOTORS CORP., Detroit, Mich.
668 passenger buses—$2,542,009

GENERAL MOTORS CORP., UNITED MOTORS SERVICE DIV., Detroit, Mich.
Starter, engine, electrical, 2780 ea—$219,481

GISHOLT MACHINE CO., Madison, Wis.
Turret Lathe—$82,072

THE GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Tires, aircraft, 1501 ea—$475,385

THE GOODYEAR TIRE & RUBBER CO., Akron, Ohio
Inner tubes, 1571 ea, aircraft—$64,796

INTERNATIONAL HARVESTER CO., Chicago, Ill.
303 five-ton trucks—$1,725,930

INTERNATIONAL HARVESTER CO., Washington, D. C.
Truck, 1066 ea—$2,529,720

INTERNATIONAL HARVESTER COMPANY, Washington, D. C.
318 tractor trucks with cab—$2,189,882

INTERNATIONAL HARVESTER COMPANY, Washington, D. C.
1066 delivery type trucks—$2,529,720

INTERNATIONAL HARVESTER COMPANY, Washington, D. C.
816 cargo trucks—$2,989,656

MARTIN COMPANY, Orlando, Fla.
Air-to-surface guided missile—$2,561,000

N. C. MACHINERY CO., Seattle, Wash.
Truck, SE4-18553—$40,386

JOHN OSTER MFG. CO., AVIONIC DIV., Racine, Wis.
Motor, 1488 ea—$152,565

THE FRANK G. SCHENUIT RUBBER CO., Baltimore, Md.
Tires, pneumatic aircraft, 1851 ea—$67,099

SIDNEY MACHINE TOOL CO., Sidney, Ohio
Engine Lathes—$213,345

TEMPCO AIRCRAFT COMPANY, Dallas, Texas
112 wing assemblies and hardware missiles—$2,184,112

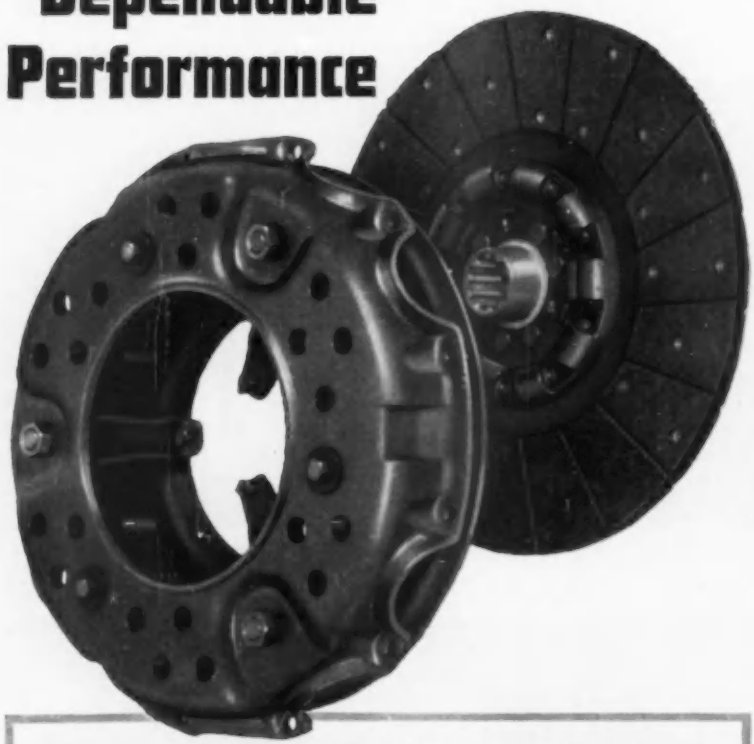
UNITED STATES RUBBER CO., Detroit, Mich.
Tires, 775 ea, aircraft—$260,075

U. S. STEEL CORP., CONSOLIDATED WESTERN STEEL DIV., Los Angeles, Calif.
Rocket Motors & Containers—$1,630,624

THE WARNER & SWASEY CO., Cleveland, Ohio
Turret Lathe, 1 ea—$55,296

Rockford Clutches For Dependable Performance

Specifically designed to meet the requirements of your projects. Rockford Clutches are longer lasting, require less maintenance and have proven performance. Write for complete information.



ROCKFORD CLUTCHES

ROCKFORD CLUTCH DIVISION — BORG-WARNER

315 CATHERINE STREET — ROCKFORD, ILLINOIS

Export Sales Borg-Warner International-36 So. Wabash, Chicago 3, Ill.

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← Circle 170 on Inquiry Card for more data

Solving difficult Bearing and Special Parts Problems–
an Aetna Specialty

The challenge of new and unusual problems is of continuous interest to Aetna design and application engineers. Their readiness to accept the difficult has established Aetna as a leading source for specially engineered or hard-to-make bearings, and hardened and ground precision parts.

Whatever your problems may be, the Aetna engineering facilities for design and application are available to assist you. Why not outline your anti-friction or parts problems for Aetna study, consideration, and recommendations on how to best achieve operational efficiency and long life expectancy in your products.

Aetna **AETNA BALL and ROLLER BEARING COMPANY**
DIVISION OF PARKERSBURG-AETNA CORPORATION
4600 SCHUBERT AVE.
CHICAGO 39, ILL.

ANTI-FRICTION SUPPLIERS TO LEADING ORIGINAL EQUIPMENT MANUFACTURERS SINCE 1916

Circle 172 on Inquiry Card for more data

Guaranteed free from defects

Every inch of fabric is inspected for defects before coating operations are begun. Here the operator is shown removing slubs.

Close up of a weaving imperfection being removed by burling.

The burling operation is one of the numerous inspections in the Reeves Vulcan system of quality control. This inspection is made on every roll of fabric before it is coated. Whatever the application, we can assure you that Reeves Vulcan coated fabrics will safely meet published specifications.

REEVES VULCAN

Reeves Brothers, Inc., Vulcan Rubber Products Div.
1071 Avenue of the Americas, New York 18, N. Y.

Circle 173 on Inquiry Card for more data

ON OUR WASHINGTON WIRE

The Army has gone into a tight-lipped huff over criticism of its unrealistic machine tool policies. Because a group of management experts stated in a recent report that most of the Army's vast inventory of tools is already behind times and will certainly be incapable of turning out the precision equipment required in modern warfare, the Army has stamped "Confidential" on all copies of the report, thereby shutting off distribution and discussion of the problem. In other words, a news blackout on the subject has been ordered. The gist of the report is that most of the Army's 80,000 tools, valued at about $1 billion, are now obsolete.

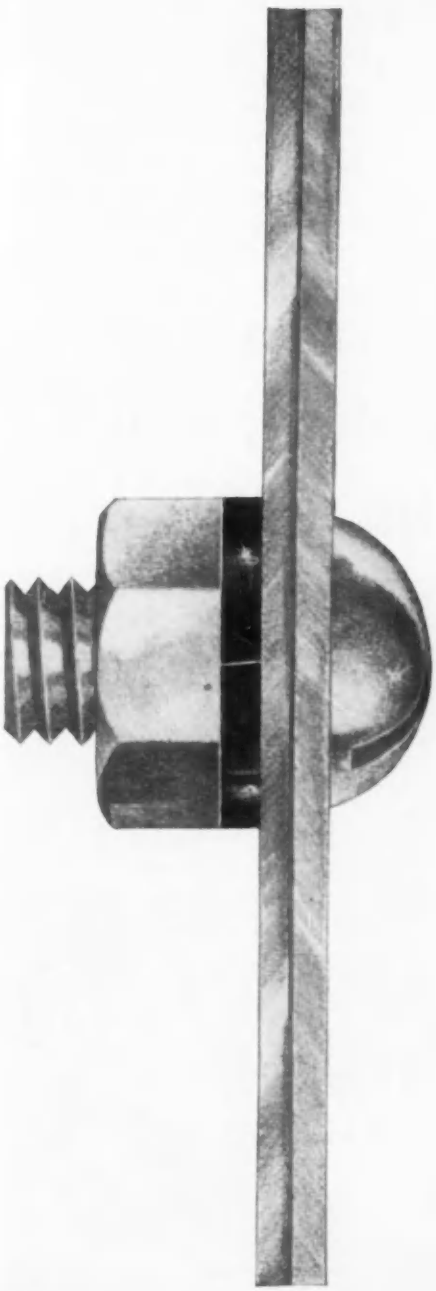
Another push for a unified armed force is under way. There is little chance the move will succeed this year. But the case for unification grows stronger with each passing month. A long list of military strategists is now openly demanding a single-uniform military machine as the only logical way to end the petty jostling and backbiting that now drain energy from our over-all defense strength.

President Eisenhower believes the Nation's economy will prosper, not suffer, if disarmament becomes a reality. He thinks money now being sunk into "negative" items such as weapons would be channeled into "positive" programs such as school construction, road building, reclamation and foreign investments.

The Air Force is going ahead with development of a manned space craft with a variety of military uses. Known as Dyna Soar, the project involves a winged glider boosted into orbit by the huge Titan intercontinental ballistic missile. Boeing Airplane Co. has been named prime contractor for the project. The Air Force has released nearly $30 million for design and ground testing of a test vehicle.

The big export push is on. The Administration has a package of sales aids to help businessmen to capture more orders from foreign countries. The package includes easier financing, overseas trade centers, better trade opportunity information, more effort to reduce trade barriers, taxes, etc., and expanded government foreign staffs.

Dealers won't get a better break in depreciating equipment, cars, and trucks for tax purposes this year. Reform in the outmoded tax depreciation laws has been put aside for at least another year. The House Ways and Means Committee will consider the problem with its over-all tax study next year. Businessmen seek to depreciate equipment faster, take obsolescence into account and offset inflation in replacement.



WHERE TIGHTNESS IS VITAL

No substitute has ever been found for a quality, properly-engineered helical spring lock washer. No other device has ever been found to combat looseness in bolted assemblies caused by thread wear, metal stress or bolt elongation. Yet, an improperly fitted helical spring washer is little better than none at all. That is why, when you specify spring washers, you should be sure you are getting the particular size and type which will do the best job for you. To be sure, consult the Eaton-Reliance spring washer specialist whose business is helping you choose the right washer to do the job. Eaton-Reliance offers a full range of sizes and types for every application—and engineering service for every problem. Write for our special Spring Lock Washer Engineering Bulletin.

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RELIANCE DIVISION
MANUFACTURING COMPANY

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SALES OFFICES: New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Los Angeles

PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Hydraulic Pumps Truck and Trailer Axles • Truck Transmissions • Permanent Mold Iron Castings • Automotive Heaters and Air Conditioners Fastening Devices • Cold Drawn Steel • Stampings • Forgings • Leaf and Coil Springs • Dynamatic Drives and Brakes Powdered Metal Parts • Gears • Variable Speed Drives • Speed Reducers • Differentials • Centralized Lubrication Systems

DOW

News about

CHEMICALLY ENGINEERED PLASTICS

Throughout the automotive industry, you'll find modern plastics at work. They contribute to the stylish, attractive appearance of car interiors. They simplify production. They even help achieve long life in the equipment used to make and service cars. The continuing development of plastics technology at Dow has provided automotive men with many ways to add to the performance and sales appeal of their product.

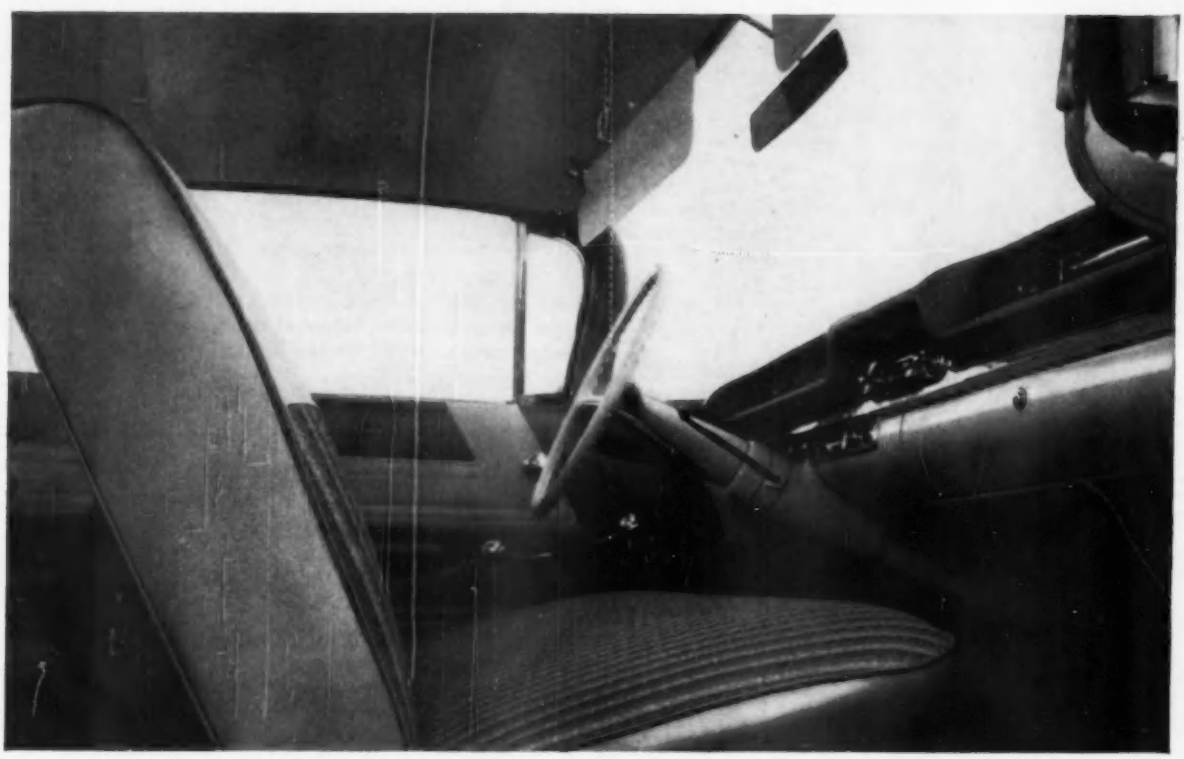
DOW PLASTICS MEET DEMAND FOR PERFORMANCE—AT LOW COST

Today's style-conscious, value-alert buyers place strong demands on a car's interior. Colorful good looks are a must! But over and above appearance, new-car buyers demand hard-wearing, abuse-taking upholstery that's easy to clean.

These many customer requirements are met fully with the help of vinyl fabrics made with Dow PVC . . .

Dow PVC (polyvinyl chloride) solves tough fabric problems involving both appearance and serviceability for seat upholstery, side panels and roof liners. With a vast array of colors and color combinations possible, fabrics of Dow PVC can be supplied in any desired surface pattern . . . with the extra value of texture and feel that spell superb quality to the serious buyer and casual shopper alike.

Besides adding eye-appeal, these fabrics have excellent aging characteristics to assure the lasting value of durability. They are cleaned with a damp cloth . . . with warm water and



soap or other mild cleansing agent needed only for the most stubborn dirt spots.

Dow supplies PVC resins, with their excellent processing characteristics, to calenderers of fine interior fabrics that help sell cars–make them more enjoyable to own and drive.

Dow Latex 2582, for the underside of automotive fabrics, makes possible even the lightest of colors. This, in turn, opens the door for high-styled fabric patterns with varied weaves, fleck designs and other creative ideas of automotive designers.

In addition, backing formulations made with Latex 2582 are highly resistant to stains – even copper and other metallic dyes–as well as to fading and aging. Dow supplies Latex 2582 both to backing formulators and to fabric manufacturers.

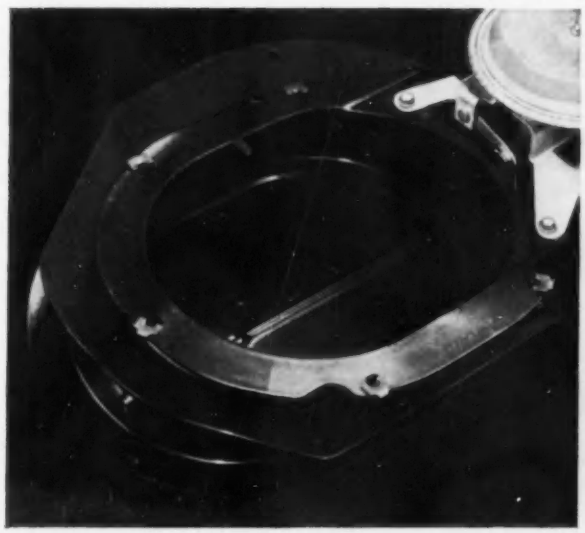
While Dow PVC and Latex 2582 help provide more colorful, more serviceable fabrics, other Dow plastics products help car makers in other ways . . . such as in the examples below.

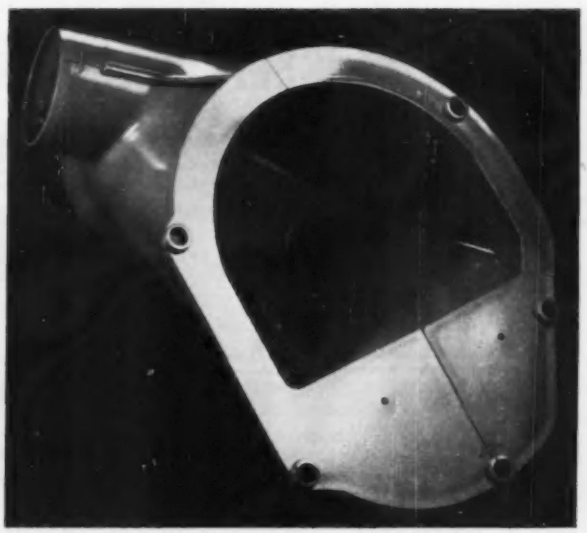
SOLVE TOUGH AIR CONDITIONING PROBLEMS WITH STYRON 440

Air conditioning answer. Styron® 440 helps automotive engineers design better heating and air conditioning system parts. This rugged Dow thermoplastic cannot absorb or transmit water. Thus, no change of dimensions due to moisture, no deterioration. No distortion from the wide range of temperatures encountered in automobile operation, either. Parts made of Styron 440 keep their snug fit throughout their long service life.

These parts are lightweight – much lighter than materials commonly used in such automotive applications. And they require no painting for protection or appearance's sake. The color – any color–is molded into the material. This means no unsightly paint chipping wherever parts are on view in the car interior.

Takes tough treatment. Styron 440 goes to the head of the class on the automotive production line, too. Its excellent moldability and fabrication characteristics cut manufacturing costs neatly. (Very few rejects, for example . . . almost none.) It's tough enough to withstand the knocks and bruises of assembly operations. Takes staples, self-tapping screws and other joining devices without a whimper, and keeps them in place on the roughest roads.





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Valiant Body Assembly

(*Continued from page* 72)

the bodies continue on this line they enter the paint dip tank where they are immersed deeply in a water-soluble paint that provides protection against corrosion in the lower parts of the body, particularly in places that cannot be reached by the spray gun.

Bodies then go through a dry-off oven, some 275-ft long, held at around 240 F to set the water-soluble paint. At this point the bodies are removed from the overhead conveyor and placed on paint trucks for the start of the paint cycle.

Surface preparation ahead of color spray is quite extensive and time-consuming. It is by no means a simple or inexpensive procedure. For example, there is the primer glaze over soldered joints, plus a red primer glaze. During the process the interior area of the sills is coated three times to eliminate the hazard of corrosion in service. Then the prime coats are applied in the large spray booths. This includes a red epoxy primer, plus a gray cover coating. These coats then are dried at a temperature of around 325 F.

Following drying the bodies enter the first wet sand deck. This is followed by dry-off in another oven. Then the conveyor dips to carry bodies down to the paint shop area on the 4th floor.

One of the major operations on the 5th floor is the application of many kinds of sealers. This is considered to be a major operation since proper sealing contributes to water-tight and weather-tight bodies. The paint shop on this floor is concerned mainly with the first color coat for two-tone jobs. After the first color coat has been applied, the bodies proceed through the color wet sand deck, then move down to the 4th floor through the opening in the floor.

When bodies reach the 4th floor they are prepared for the final color coat. Two-tone jobs are masked immediately. All bodies are dusted, vacuum-cleaned, and tack-ragged before entering the color booths.

After the paint cycle has been completed and the job accepted by the inspectors, the bodies are transported to the trim department. Final assembly of the car was described in a previous article. ■

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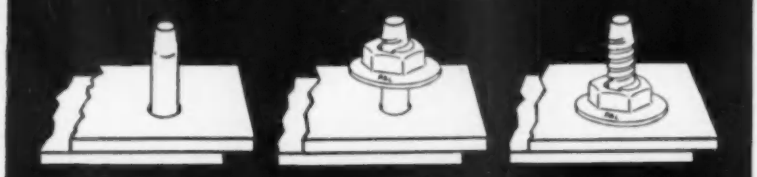

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One-piece self-threading nut performs functions of ordinary nut, lockwasher and flat washer. Resilient washer base distributes tensile force, avoids dimpling of sheet metal or damage to fragile parts. Available with large or small base diameters; also with bonded-in plastisol compound to seal out water and dirt. Stud sizes: 1/8", 5/32", 3/16" and 1/4" dia.

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Spring-tempered steel PALNUT Self-threading Nuts apply like any ordinary nut with standard tools or high-speed PALNUT magnetized wrenches. Assemble perfectly, even on off-angle studs, in confined space, against curved surfaces. Hold tight, seated or unseated. May be removed and re-used on same studs. Use on any malleable material.

REGULAR TYPE—STYLE SR

For assemblies where space is limited. Uses shorter studs, less seating area. Internal wrenches may be used. Stud sizes: 1/8", 5/32" and 3/16" dia.

ACORN TYPE—STYLE SC

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PALNUT®

LOCK NUTS and FASTENERS

V-6 and V-12 Engine Production

(*Continued from page* 64)

of detail involved in the manufacture of a complete engine, we shall have to content ourselves with a highlighting of operations. Even so, it becomes necessary to cover the ground in several installments. The present article will be confined to details of cylinder block machining and bearing caps. The following installment will deal with the cylinder head and crankshafts.

First major equipment on the cylinder block line is a special 36-station transfer line, supplied by Cincinnati Milling. It includes what has been termed the world's largest horizontal surface broaching machine, followed by stations

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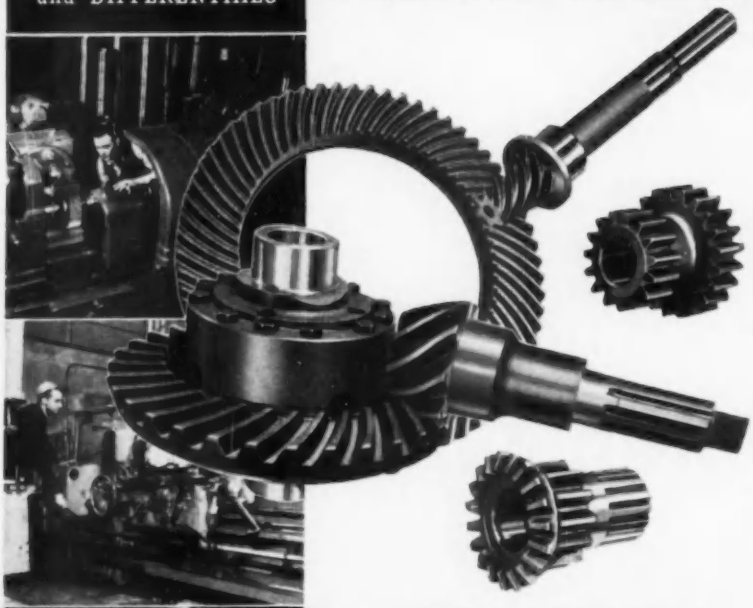

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for drilling and milling. Altogether this equipment surface-broaches 12 surfaces; drills and reams four holes; and mills 10 surfaces. It handles both V-6 and V-12 cylinder blocks. The line runs about 140 ft in length, uses 30 motors capable of producing more than 1000-hp.

The broaching machine has a 600-hp drive and is capable of developing a broaching force of 100 tons. Typical of such machines, this one is of three-station type. It handles the broaching of the top, bank faces, panrail, bearing locks, and bearing halfbores. The ram is fitted with an enormous array of tools and tool bits, over 1500 in all. The first operation has 960, one-inch-square brazed carbide-tipped bits for the banks; 280, 5/8-in. square brazed carbide tipped bits for roughing the top face; 24 finishing blades. The second operation requires 242 individual tool bits. On V-6 blocks the ram speed is 120 fpm; on V-12 blocks ram speed is 60 fpm.

Blocks now enter the drilling station for producing manufacturing holes. Three holes are drilled, two holes reamed on V-6 blocks; four holes are drilled and reamed in V-12 blocks. The block moves into an idle station, then into a roll-over where it is rotated 180 deg for milling. Five tools are used on V-6; eight tools on V-12.

The first stage of milling handles two mounting pads on V-6, four on V-12. In addition, four angular bosses are milled at this station. Next operation is rough-milling of the front face of the block, using two spindles, removing about 3/16-in. of stock. The block advances to the next station where the front face is finish-milled, removing about 0.020-in. of stock. The rear face then is rough- and finish-milled in the last section of the line.

Following broaching and the associated operations outlined above, blocks move into an Ex-Cell-O transfer line which handles the rough- and semi-finish-boring of cylinders, as well as chamfering of top and bottom of the bores. Then they enter an Ingersoll special in-line milling machine. This mills the sides of crank bearings, lock slots, roughs oil seal and slinger grooves.

Next in line is the sinuous arrangement of four Cross Trans-

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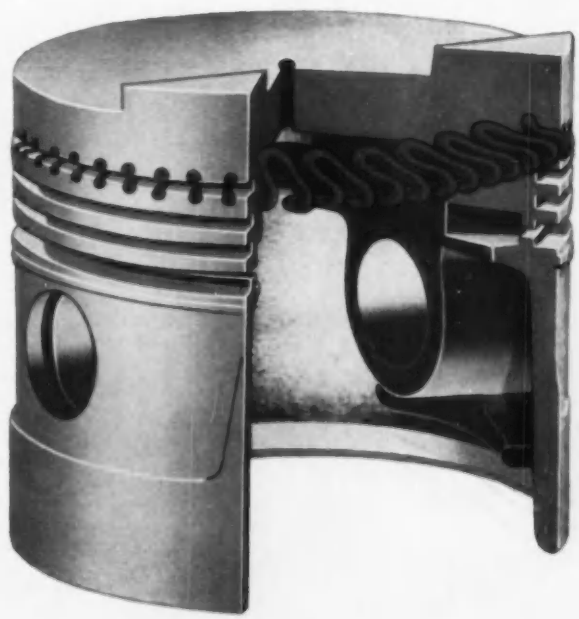

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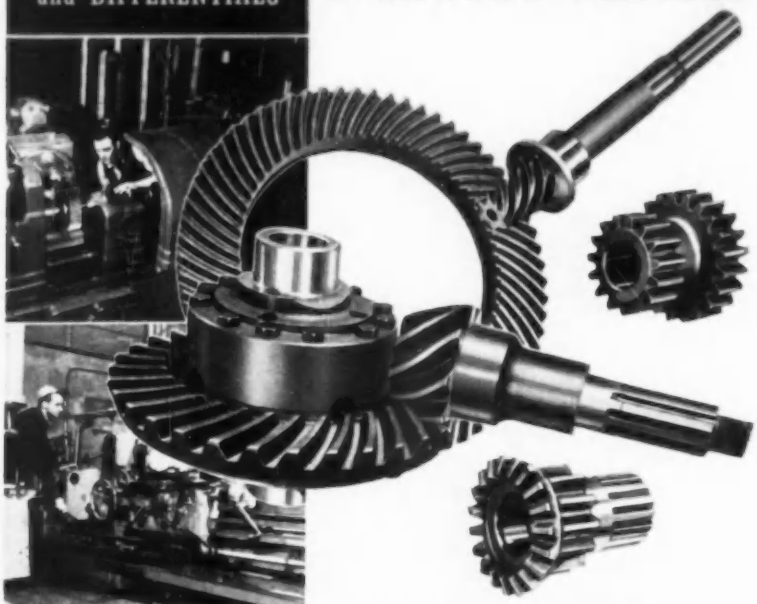

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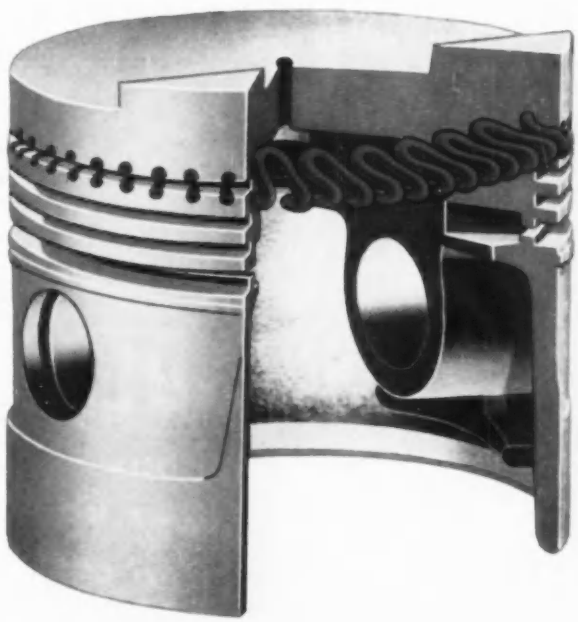

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fermatic machines, shown schematically in the line drawing. It runs some 450 ft in developed length, the center leg being a 100-ft long accumulating conveyor that joins the machining sections and provides the banks of blocks for stand-by. Non-common operations are handled with standby spindles and heads. A novel two-stop transfer mechanism reduces the number of spindles required to machine V-12 blocks by about 50 per cent.

The Cross setup includes some 82 stations of which 25 are idle stations. To prevent damage to the heavy blocks, Cross lift-and-carry transfer mechanisms are used throughout the machining sections. Because of the offset in cylinder bores in V-12 blocks, they are moved in a pattern different from the V-6. In some stations the block is shuttled to one side, at other stations the drill heads and bushing plates are shuttled, while in still other stations the V-12 block stops twice under each multiple head. In two-stop transfers for V-12 blocks, the front half is machined at the first stop, the rear half at the second stop.

Deep oil galleries are drilled progressively in one section of the machine, being drilled half-way from each end. Five passes are required on V-6 blocks, eight passes for V-12.

It is claimed that each section of the Cross line can be changed over from one block to another in an average of but eight man-hours. Spindles and tools are suitably coded to simplify the set-up, two rings indicating that the spindle or tool is for use only with V-12, one ring for V-6, no marking indicating common use. Both carbide and H-s-s tools are employed. Carbides are used for boring at speeds of 200-300 fpm, for reaming at 100 fpm.

Consider now a few details of the Cross machines. Section 1 with some 30 stations, does the drilling, reaming, chamfering and tapping operations on both ends of the block, including rough- and semi-finish boring of camshaft holes, drilling oil gallery holes, and boring the distributor hole. All operations are common to V-6 and V-12 blocks except for additional camshaft boring operations required for the V-12.

Section 2 with 26 heads and 19 stations, performs some 104 operations common to all blocks, plus 180 additional operations for the V-12. The changeover is made by means of a selector switch for automatically locking out heads not required, together with manual adjustments to conveyors, fixtures, and tool changing. Operations include machining of holes in the pan side of the block, including panrail, bearing caps, oil filters and oil holes.

The holes in V-12 blocks have the same pattern as the V-6 but are displaced 3.2-in. from other holes common to both blocks. To take care of this shift Cross has developed an ingenious shuttling arrangement combined with transfer. At station 14 of this section, the V-12 block is lifted from the transfer nests by a floating carrier. Then as the transfer bars return, a dog on the bar moves the block and carrier to the right. The carrier then lowers the block onto the transfer bars for the next move-

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Exacting engine control believed impossible only a few years ago is now the expected, not only in modern aircraft and missiles, but also in today's automobiles and trucks. And, this absolute accuracy is demanded under temperature, pressure, and power conditions found, until recently, only in laboratories. Temperature variations alone of −80°F to +160°F require almost continuous compensations in today's jet aircraft and missiles. More, these ever-increasing requirements must be designed for ever-decreasing standards of size and weight.

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ment. The shuttle mechanism is locked out when V-6 blocks are machined.

Next is the Sundstrand tunnel broach which is used for finish-broaching the bearing cap lock and seat, initially roughed in the Cincinnati surface broach at the head of the line. This is followed by blow-off and assembly of bearing caps in a Bilt-Rite machine. The blocks now are ready for movement through the next two Cross machines.

They are transferred into Cross Section 5 for a series of drilling, chamfering, reaming, and tapping of all holes in the top cover face. This section has 12 stations, 18 machining heads. The majority of operations are the same for V-6 and V-12, except that the V-12 has approximately twice as many holes, this being handled by double cycling.

Section 6 of the Cross line handles all holes in both banks—drilling, chamfering, reaming, and tapping; drilling, boring, and reaming valve lifter holes. This machine has 21 stations, 28 heads.

Altogether the Cross Transfermatic line incorporates nine probe and auxiliary unload stations, plus an air test station. They perform 171 inspections, automatically, on the V-6, 231 on the V-12.

Following wash and plug assembly, the V-6 blocks proceed to a Natco horizontal boring machine for rough-boring crank and cam bore, and rough-boring the distributor hole. Finish-milling of the oil seal and slinger grooves, finish-facing and chamfering of thrust bearings is done in a Kearney & Trecker special inline mill.

V-6 blocks now enter another Natco horizontal boring machine for semi-finish-boring the cam and crank line; assembly of camshaft bearings; finish-boring the cam and crank bore; finish-boring the distributor hole. Then to another Ingersoll inline mill for finish-milling both banks.

Cylinders are finish-bored in an Ex-Cell-O inline precision-boring machine; and the top face of cylinder bores re-chamfered in a six-spindle Buhr chamfering machine. Bores are honed in six-spindle Barnesdril honing machines. For the V-6, they hone one bank of three in vertical position, then rotate the fixture to hone the other bank.

The several paragraphs immediately preceding refer to the machining of V-6 cylinder blocks. It is noteworthy that immediately following wash, after leaving the last Cross unit, V-12 blocks follow a by-pass course. Here a Snyder horizontal boring machine is set up for rough- and semi-finish-boring of the cam and crank lines, rough-boring the distributor hole. An Impco special mill cuts the oil groove in cam bearing; and cam bearings then are assembled in a Bilt-Rite special press.

V-12 blocks now go through another Snyder horizontal boring machine for finish-boring the cam and crank lines as well as the distributor hole. Blocks then go to a special Barnesdril three-spindle honing machine where the block is honed in four passes.

Final operation, after washing,

(*Turn to page* 147, *please*)

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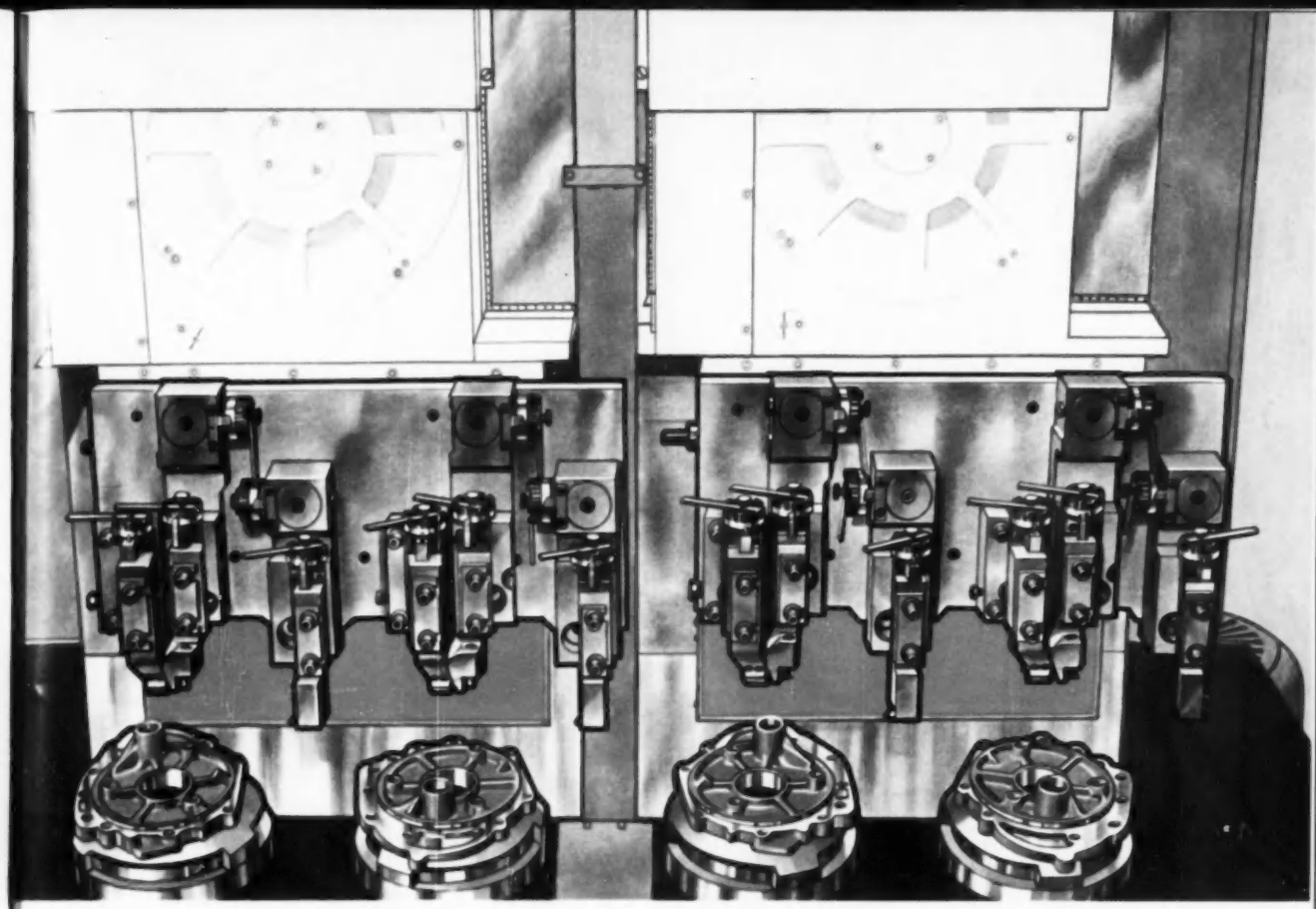

Precision boring
New Britain's new approach

New Britain Cam Actuated Vertical Precision Boring Machines offer an entirely new principle for more accurate boring and turning, plus compact exterior design and fast tooling. Rough cuts and finish cuts within close tolerances on the same set-up are characteristic. Standard models are available with maximum swing from 12" to $17\frac{3}{4}$" in 10 or 15 horsepower.

Here are a few of the major new developments incorporated in these unusual machines.

Greater accuracy. Both the vertical and cross slide cams are mounted on a common shaft which is contained inside the vertical slide. The linkages found in conventional cam-operated contouring machines are eliminated. Both the vertical and cross slides ride on preloaded roller bearings and are deflection-free.

Clean-sided design. Any number of these self-contained machines, each with one or more spindles, can be arranged side by side. Depending on how they are tooled, they operate either as a single unit or as individual machines. Parts can be inverted on adjacent machines or on adjacent spindles of the same machine, finishing both sides, completing *all* operations in one integrated, high-volume operation.

Fast tooling. Unrestricted accessibility allows rapid tool and cam changes.

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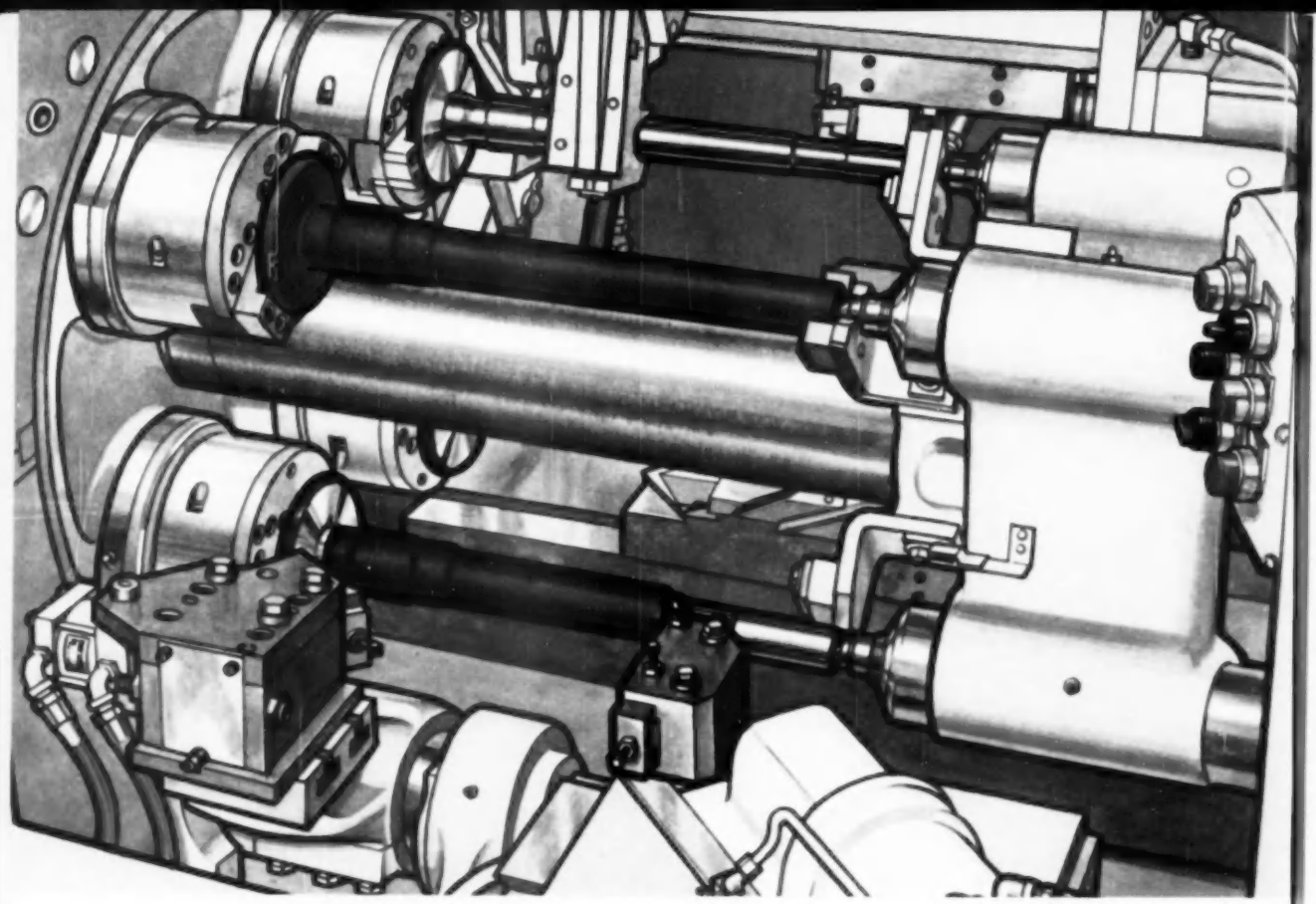

Idea for volume producers of shafts

Economists are making startling predictions on this year's increase in productivity. They say it will be twice that of recent years—up as high as 10% in some manufacturing industries.

Whether or not these predictions come to pass, it's certain that it won't happen in plants using outdated equipment.

Shaft work is a problem to many firms. New Britain pioneered template-controlled contour turning and boring, solving the problem for many progressive companies. Now for the manufacturer with really high volume requirements we present Model 412-25—a four-spindle, template-controlled machine capable of producing a four-fold increase in productivity per man hour.

The basic principle pretty much speaks for itself. As in the case of the single-spindle contour lathe, inexpensive metal templates control the full cycle and re-cycle if required. Simple, single-point tools replace complex gang tooling. Setup is simple and fast. When tools wear, merely replace them. Since all relationships are maintained by the template, tool replacement involves no problem.

When the volume of contour turning warrants it, this machine can be the best money maker on the production floor. Your New Britain representative can quickly tell you after looking at your prints and learning of your production requirements. Meanwhile, we would be glad to mail you descriptive literature containing the basic facts and specifications. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

THE NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division - New Britain, Connecticut

V-6 and V-12 Engine Production

(*Continued from page* 144)

is bore inspection and grading in an automatic Sheffield air gaging and electronic machine. It checks automatically for out-of-round and taper and classifies the bore. Bores are graded in six classes in steps of 0.0003 in. Bore finish is held between 15 and 25-microinch. Tolerance on out-of-round and taper is held to 0.0005 in.

Mention was made earlier of the assembly of main bearing caps at one point in the sequence on the Cross machine. It is of interest that a compact line for machining main bearing caps is set up adjacent to the block line to facilitate handling. The equipment is tooled to handle main bearing caps for both V-6 and V-12. As is the usual practice, an entire set of main bearing caps is cast enbloc and put through as a single work piece. The first operation is in a LaPointe horizontal surface broaching machine with a formidable array of carbide-tipped tool bits. It broaches the mating face and bearing half-round as well as the sides.

Then the block is fed into a compact 21-station Baker transfer machine. Here the part is automatically milled, drilled, counterbored, reamed, etc., and cut apart as the work enters the last station. Installation in the block takes place nearby.

The entire cylinder block department is tied together with an Anchor Steel conveyor system, containing approximately 900 ft of conveying and transfer equipment. Depending upon the duty, this equipment is of two basic types—inline transfer, and cross transfer, interlocked with machines, inspection stations, and manual operation stations. For transfer from station to station they use power roll conveyor units. Cross transfer is handled with either side-car transfer devices or walking-beam mechanisms. All transfer equipment is fully automatic and is synchronized with the machining operations.

Part II of this three-part article will appear in an early issue of AUTOMOTIVE INDUSTRIES

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Users everywhere agree that their best way to clean iron and steel parts is to tank-soak them in a hot solution of heavy-duty Oakite 24. This hard-working alkaline cleaner gets under the dirt layers and literally tears the soil from the surface. Despite excessive soil contamination of solution Oakite 24 maintains proper pH level and provides long, effective cleaning action.

Oakite 24 is but one of a wide range of alkaline tank-cleaning compounds. Others include medium and light duty oil and grease removers; self-emulsifying solvent cleaners specially designed for removing buffing compound residues, pigmented drawing compounds and other tenacious burned-on solid-particle dirts and smuts. Also available is a useful selection of materials for cleaning brass, copper, aluminum, magnesium, lead, tin and zinc.

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New . . . tested and proved to protect ten times load cell capacity, PM's Overload Protector, designed by Lebow Associates, eliminates "down time" and replacement costs due to damaged strain gage load cells. This is the first practical protector made that retains the load cell's original accuracy during or after overloading, either in tension or compression. Used wherever there is danger of breakdown due to possible shock loads.

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PERFORMANCE MEASUREMENTS COMPANY

15120 Third, Detroit 3, Michigan

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Old Reliable Cars for Indianapolis "500"

(*Continued from page 60*)

is 21 in. from the ground to top of hood at the front axle, 37 in. from the ground to the top of the tail fin. The widest part of the body is 31 in. Wheel base is 96 in. and ground clearance a little over four.

Lightweight magnesium wheels by Halibrand carry 7:60 x 16 Firestone tires at the front and 8:00 x 18 at the rear. All tires will be inflated to 45 lb pressure.

Injection of a water chemical along with the air will bring tire temperature down. The car will use three sets of tires during the race, two sets during practice, and another set for qualifying runs.

The Halibrand four-wheel spot brakes have hydraulic cylinders which clamp a new Raybestos brake lining on both sides of the exposed brake discs. All the brake lines are stainless steel tubing. Twin telescope-type shock absorbers are on the front wheels. Other equipment: Halibrand rear end and steering gear and Joe Hunt Magneto.

The front wheels have balancing weights both inside and outside. Up to now, the weights were just on the outside of the wheel.

A. J. Watson, Glendale, Calif., is one of today's top designers of Indianapolis-type racers. The 35-year-old builder will come to the track with six new cars. He's itching for another win after taking the top spot in last year's race.

The six cars are almost alike. You'll spot them by these features: externally mounted oil tank; exhaust pipe shortened to a point just in front of the left rear wheel; and a high-speed fuel intake opening above the rear wrap-around bumper. For good measure, the Watson cars have an auxiliary gas intake system. The two-holed spring-loaded opening is behind the driver's head on the rear fuel tank.

Watson still rides with the engine mounted straight up. However, he does use off-center placement—off-center to the left.

Big feature in all Watson cars: three built-in air jacks. They're for high-speed tire changing during pit stops. And in recent years that's where many a race has been won or lost.

How do the jacks work? When the car pulls into the pit, a crewman plugs an air hose into the side of the car. This works the jacks. And the car's off the ground in 0.3 sec. Release the air, and the car's down in 0.7 sec. This might well cut a big 10 to 15 sec off a pit stop.

Other cars in the Watson 1960 series will feature contour-fitted driver seats and a hand-operated weight-shifting device.

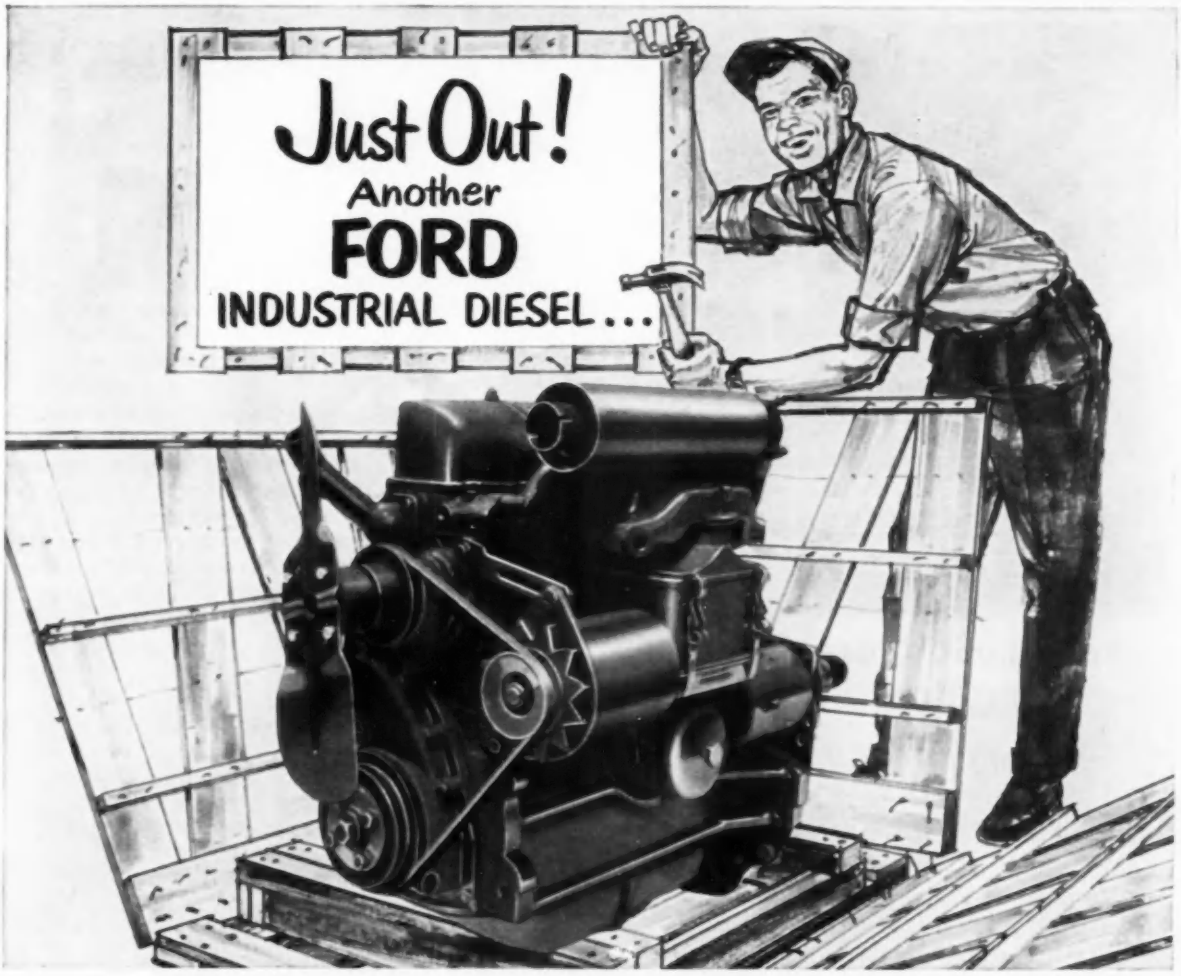
Veteran builder Lujie Lesovsky, Los Angeles, has a new entry ready to go. It's an improved version of his car that took the pole position last year with a blistering 145.908 mph.

Design changes include a laid-down engine, Watts linkage on the differential and front axle, a narrowing of the chassis behind the cockpit, and an upswept flare in the cowl. Keep an eye on this car—Kelso Auto Dynamics Special.

Old-timer Jean Marcenac, Sherman Oaks, Calif., will nurse the famous Novis through their 15th season. This year Marcenac designed and installed aircraft-type fuel injection systems for the 8-cyl supercharged engines. Reason for the new design is to keep a constant air-fuel ratio at any engine speed. It may be just the thing to do the trick for the Novis. The unit performed well at all speeds—even above 200 mph — in California tests.

Almost every year one or two persons try to ready a production engine to power an Indy car. They rarely even make it to the track, let alone break into the race.

This year, a firm in San Diego has high hopes for a Chevrolet engine. What's intriguing about this one is that the car was designed specifically for this type engine. In the past, production engines were simply dropped into existing Indianapolis chassis. Veteran builder Eddie Kuzma is the mechanic on this one. ■



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What's more, Ford's 172 Diesel and 172 Gasoline engines are *interchangeable* in your equipment. Many *parts*, too, are interchangeable between these engines. And low-cost Ford parts and service are always available at any nearby Ford Power or Tractor Dealer.

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ENGINE SERIES		172 FOUR DIESEL	220 FOUR DIESEL	330 SIX DIESEL
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Type		4-Cyl. O.H. Valve	4-Cyl. Diesel	6-Cyl. Diesel
Bore and Stroke—Inches		3.9 x 3.6	3.94 x 4.52	3.94 x 4.52
Displacement—Cubic Inches		172	220	330
Brake Horsepower	Dynamometer	59 @ 2400	60 @ 2250	96 @ 2250
	80% Dyn. BHP	47 @ 2400	48 @ 2250	77 @ 2250
Torque	Dynamometer	140# @ 1200	151# @ 1600	236# @ 1600
	80% Dyn. BHP	112# @ 1200	121# @ 1600	189# @ 1600
Compression Ratio		16.5 to 1	16 to 1	16 to 1

INDUSTRIAL ENGINE DEPARTMENT, FORD DIVISION, FORD MOTOR CO., P.O. BOX 598, DEARBORN, MICH.

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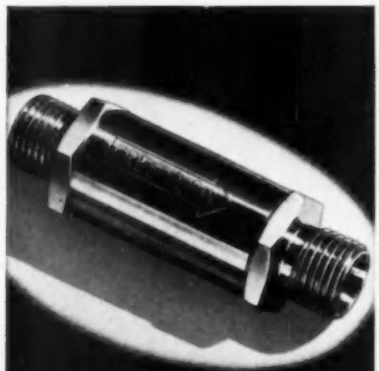

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Simca Advanced Machining Lines

(*Continued from page 84*)

on the two horizontal transfer bars that extend through the first four stations, with fixtures on the left and unit heads on the right. Here the axle tubes are loosely retained by spring clips, with their lower ends resting in a guide channel. Gaging blocks facing the upper ends provide an initial check for length so that faulty parts cannot accidentally damage the machine or tooling.

Indexing of the transfer bars moves the axles into the first work station, where hydraulic rams on the tool side push them transversely out of their carriers against location V-blocks, above and below the dual fixtures, that engage the machined ODs of the hub ends. Banjo housings (with closed faces inwards) are now horizontally aligned in the fixtures by another pair of rams that extend outwards from the sides of each fixture, rotate slightly so that their clamping fingers swing over the exposed ring faces, and draw them inwards for positive location in all planes.

Thus positioned, each banjo housing is finally clamped by four interacting hydraulic rams radially disposed around the circular stamping. The clamping fingers now release and swing away from the ring face, and the machining starts.

At the first station the ring for mounting the differential case flange is faced and its ID bored, the latter to close limits since it is used as a datum for machining the hub ends in the second section of the line. Workpieces are unclamped and returned to the carriers by reversing the loading process. The ring is drilled at the second station, and the resultant eight bolt holes are successively countersunk and tapped at the third and fourth. Location and clamping is similar in each case.

Pairs of axles leaving the last station of this section are advanced in a vertical position by the transfer bars into the turnover fixture. This consists of upper and lower guide channels carried off-center on two circular rails supported by rollers. The transfer bars retract when the work is in place, and the fixture rotates 90 deg to position the axles horizontally with the open ring faces downwards.

Cycling of the second section of the line is synchronized with that of the first, so that the former's pair of transfer bars in a horizontal plane now travel rearwards to extend beneath the incoming housings, then elevate to lift them clear of their guide channels to the centerline of the circular fixture. The axles are thus advanced to the first work station of this section, which consists of 8 twin-headed double-ended stations for machining and final gaging both hub ends simultaneously.

Transverse location of each housing is by the previously-bored ID of the ring, which is internally gripped by an expanding fixture when the open face of the banjo is lowered onto it by the descending transfer bars. Meanwhile, hub ends are located on V-blocks against which they are clamped. This sequence for transfer, loading and clamping is repeated at all subsequent stations.

The seven double work stations for the hub ends cover facing and drilling the mounting flange for the brake backplate, and a series of boring and counterboring operations for the axle shaft outer bearing and adjacent oil seals. At the eighth station bearing seats are checked by air gages whose heads automatically feed into the finished bores after the hub ends are positively clamped in V-blocks.

Completed axle housings leaving the machine are deposited by the transfer bars on an exit chain conveyor which moves them into position for easy transference to one of the circulating monorails. A point of interest on the Burr line is the tool board which incorporates individual counters that record the number of cycles performed at each station. Since tool life varies with the operation, these indicators in conjunction with warning lights make possible systematic tool

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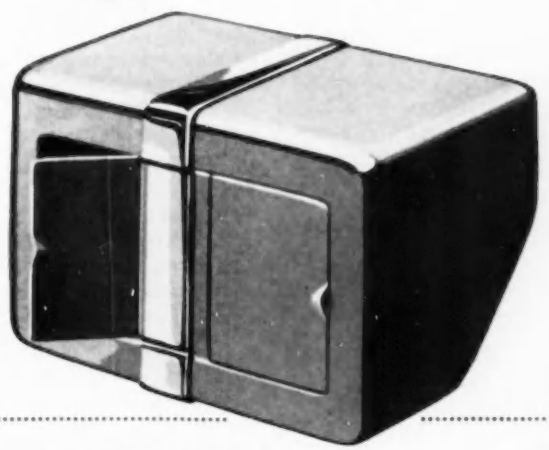

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Production soars from 800 to 3500 pieces per hour

...with OSBORN power brushing

PRODUCING at the rate of 3500 pieces per hour (over 330% greater than former off-hand method) these Osborn TY® Master® Wheels remove troublesome phenolic-type residue from electric motor commutators at Dayton Precision Manufacturing Co.

Slow, off-hand methods were being used to remove insulation residue from these commutators. Production was costly . . . parts lacked uniformity.

A specialized, but simple machine now handles the operation. Parts are automatically fed along a guide tube and through a pair of Osborn TY® Master® Wheel brushes. In this centerless type finishing setup—the job is done effectively in pre-set time cycles. Results: production and quality up—rejects eliminated . . . time and costs down.

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Osborn Brushes

METAL FINISHING MACHINES . . . AND FINISHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY

changes in order to maintain the required accuracy.

Another production highlight at Poissy is the line for Aronde brake drums that uses standard rotary-indexing machines linked by locally-built handling equipment to achieve economical automation. Most noteworthy is the first part of the line, which consists of two Bullard 8-spindle vertical lathes in parallel feeding a French G.S.P. 5-station vertical unit, all tended by a single operator.

The duplicate Bullards are supplied with castings from separate inclined lengths of roller track stocked manually from a common point. The gravity track leading to each machine descends to a level about two feet above the floor, where it terminates in a vertical elevator onto which drums are released singly by an interlocking pneumatic brake-escapement mechanism straddling the end of the track.

As a drum, rim up, rolls onto the elevator platform it automatically triggers the air lifting ram that raises it another two feet to present it to the loading arm on the Bullard. This standard load-unload arm, also air-operated, has a pair of vertical rams with expanding clamps that drop into the respective drums waiting on the raised elevator and at the final station of the 8-position indexing table.

When the drums are internally gripped on their friction areas they are lifted to clear the elevator and table fixture, after which the supporting arm swings through a 150-degree horizontal arc to position the incoming drum over the empty fixture and the finished one over the exit roller track. It then lowers and releases them. The machine chucks the casting externally, and at the seven work stations faces and turns the internal and rim areas, operating on a 40-second cycle.

Exit rim tracks from the two identical Bullards converge and run parallel to carry drums in pairs to the G.S.P. unit that drills, countersinks and taps the central mounting holes. Released in pairs by a mechanism similar to the earlier one, drums roll to the end of the tracks, where vertical pneumatic

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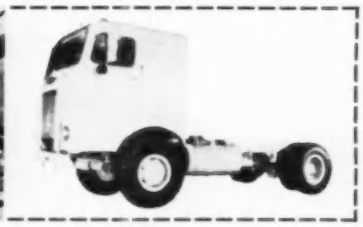

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cylinders thrust upwards past the last roller to lift them to within reach of the overhanging load arms.

These also descend to grip the drums internally, while the similar unload arms simultaneously engage the finished pair on the machine table. As the two arms swing horizontally on their common vertical column an integral jet blasts compressed air into the empty dual fixtures as it sweeps past.

Incoming parts are now loaded into the fixtures, where they are located by central dowels passing through the hub bores. Downward clamping in each case is by two curved fingers rotating out through the cutaway dowel to bear against the internal drum face. They are extended by a rack and pinion actuated by a hydraulic plunger at the load station.

Meanwhile, drilled and tapped drums, released from their fixtures, are swung over the start of the outgoing track where they are dropped onto swivelling plates. These tilt them from horizontal to vertical so that the drums roll down inclined guide rails directly into a washing machine, prior to finish turning and honing.

Efficient handling equipment linking standard machines is also featured on the line for the larger Ariane and Vedette brake drums. Here a pair of dissimilar front and rear drums are picked off the incoming roller track by loading arms that transport them to the Ryder 4-station vertical automatic which machines the external faces and cooling fins.

Unloaded drums are then moved by hand to one of three gravity channels leading to a trio of six-spindle Bullards where the internal faces are turned after hand loading. Similar output channels from these machines converge on a Bausch 8-station multi-spindle machine that drills the rear hubs and the front ones together with their hubs. This relatively simple setup is Simca's low-cost approach to machining 1000 drums a day, since the larger cars are produced in limited numbers. ■

Part II of this article will appear in an early issue of AUTOMOTIVE INDUSTRIES

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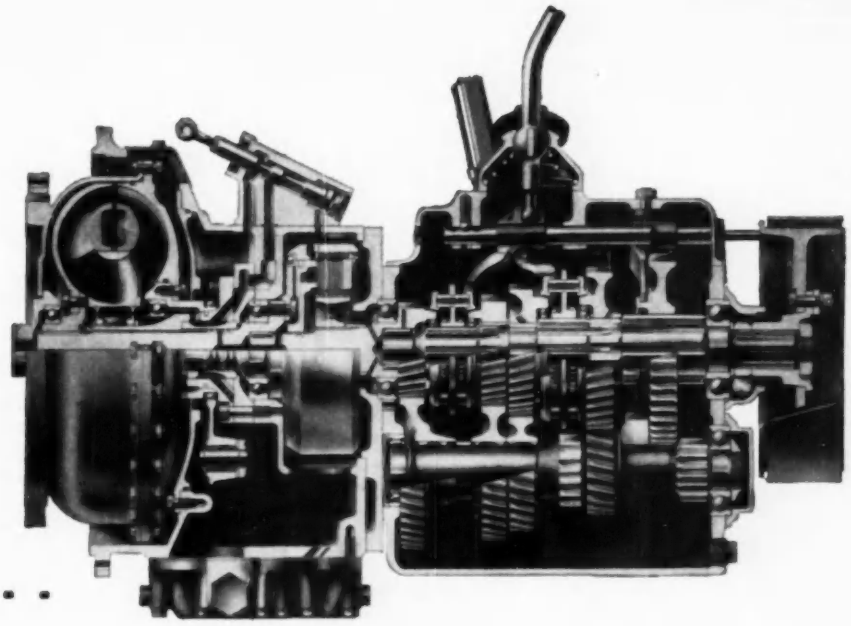

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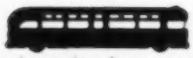
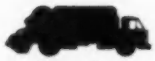
Trucks Operating on delivery schedules



Coaches making frequent stops



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The new corporate name, Garlock Inc., more closely identifies this 73-year-old company with the growth and development of its product lines. *Today, industry goes to Garlock for such widely diversified products as:*

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- Metal Packings
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- Electronic Components
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To help you in selecting or applying these products, Garlock offers the services of over 126 thoroughly-trained sales engineers, 175 electronic component manufacturers' representatives, 180 authorized bearing distributors and 69 foreign distributors. Conveniently located warehouses and stocking points assure Garlock customers of prompt delivery.

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GARLOCK

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Plastic Stock Shapes
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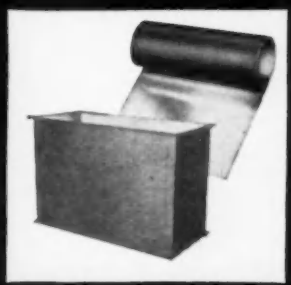
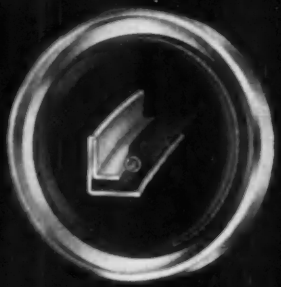
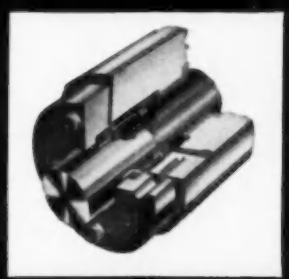


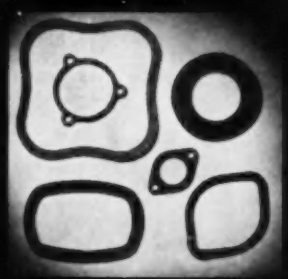
Fluorocarbon Tank Linings



Oil and Grease Seals



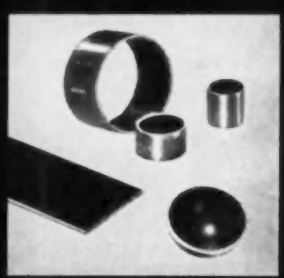
Mechanical Shaft Seals



Gasketing

Spiral Wound Gasketing

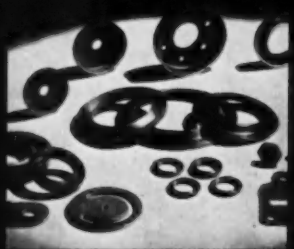
Metal Packings



Dry Bearing Material

I N C .

Missile and Rocket Components

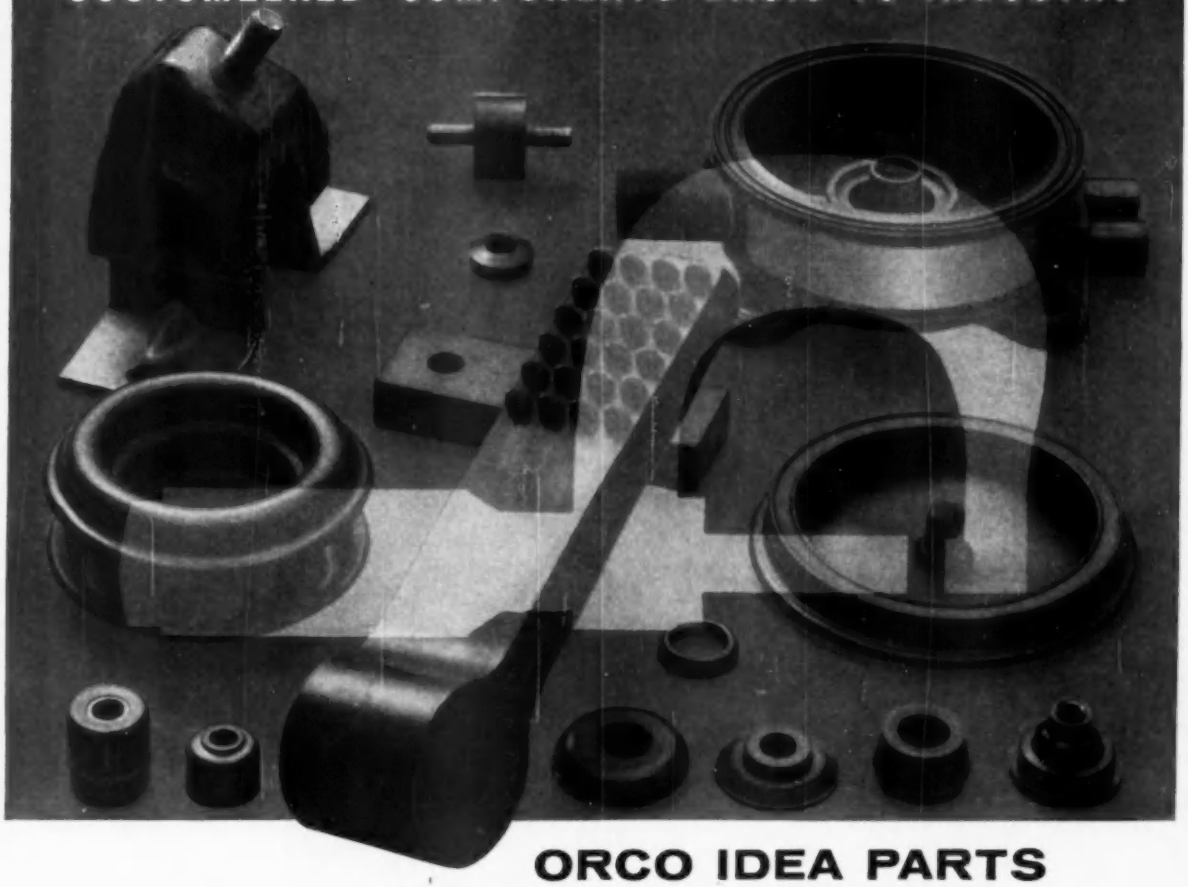


Leather Packings

Electronic Components

OHIO RUBBER

"CUSTOMEERED* COMPONENTS BASIC TO INDUSTRY"



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shape up OEM designs—profitably!

OHIO RUBBER IS THE GOOD SOURCE FOR THE OEM!

ACROSS THE BOARD in industry, ORCO IDEA PARTS offer the design engineer product quality evolved from Ohio Rubber's years of experience in supplying "Customeered"* components for outstanding original equipment manufacturers nationwide.

ORCO CUSTOMEERING* is geared to cut production costs—to deliver a better part. And it goes to work for you as soon as performance requirements are checked, a materials recipe is formulated, expense-shaving design modifications, if necessary, suggested. The full scope of ORCO integrated design, research and practical ingenuity in custom-manufacture of rubber, synthetic rubber, silicone rubber, polyurethane, and flexible vinyl components is focused on your component.

ORCO CAPACITY offers the facilities of four modern plants. These include design, building, and maintenance of precision molds and dies . . . permanent bonding-to-metal . . . compression and transfer molding . . . extruding of all shapes, sizes, and types . . . complete laboratory facilities . . . statistical quality control . . . coordinated production control.

SUGGESTION — send for ORCO Bulletin 715 for the complete money-saving story of "Customeering". It's yours for the asking!

*Trademark of The Ohio Rubber Company

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ORCO **THE OHIO RUBBER COMPANY**

General Office • WILLOUGHBY, OHIO • WHitehall 2-0500

A DIVISION OF THE EAGLE PICHER COMPANY

EAGLE EP PICHER

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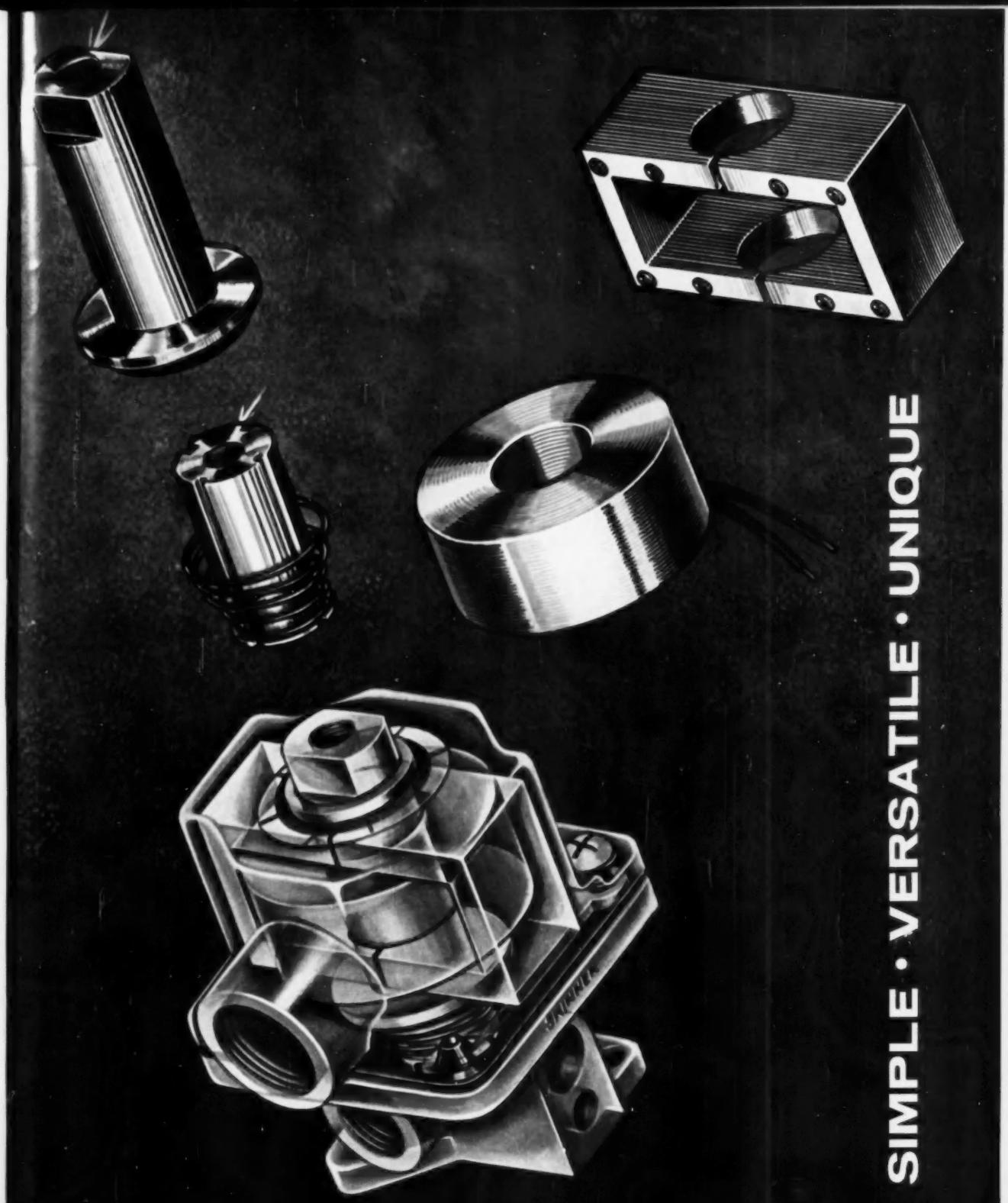


SIMPLE • VERSATILE • UNIQUE

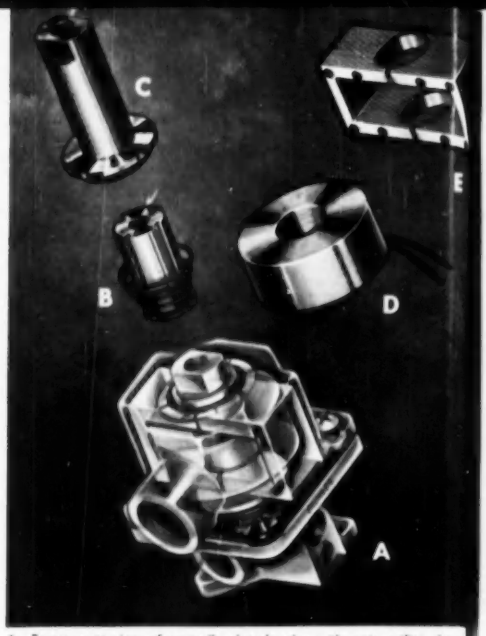
New **SKINNER** *3-way Solenoid Valves*

All Skinner Solenoid Valves are...

SIMPLE— Only two moving parts in direct acting valves. Stainless steel internal parts resist corrosion. Soft synthetic inserts provide bubbletight sealing. Most types available in explosion-proof construction.

VERSATILE— Literally thousands of variations are possible—mounting, flow control and porting . . . electrical options in coils, voltages and frequencies . . . types of media, operating temperatures, etc.

UNIQUE— Skinner valve seat does not cut inserts, assures bubbletight sealing and long life. Skinner valve sleeve assembly is precision welded to provide over 5,000 PSI burst strength. Skinner standard valve designs are readily modified for custom applications. From first step in manufacturing to delivery, Skinner quality control and 100 per cent testing builds valves Skinner guarantees for long, trouble-free life.



A—Transparent view of normally closed valve with main orifice shown
B—Plunger and spring C—Sleeve D—Coil E—Yoke

SKINNER three-way solenoid valves solve your control system problems

Whatever your problem in controls . . . in machine tool automation, automatic clutching or braking, packaging, instrumentation, laundry equipment, air conditioning, or in any of thousands of applications involving air and hydraulic cylinders or pressurized mechanisms . . . Skinner has the answers.

Skinner design leadership and quality manufacture of solenoid valves has been proved by universally successful use. And as control problems become more complex, Skinner keeps pace with new designs, new valves, and continued top quality production.

The new A series shown above, the new L series, the V5 and V10 series complete the line of Skinner 3-way solenoid valves. Your selection is unlimited.

	V5 Series	V10 Series	A Series	L Series
Orifice sizes	1/32" to 1/4"	3/32"	3/32", 1/16", 1/32"	3/16", 1/8", 1/4"
Pressure Ratings	Up to 200 PSI	1000 PSI	Up to 250 PSI	5 to 150 PSI
Types	Normally open, normally closed, directional control, multi-purpose	Normally open, normally closed, directional control, multi-purpose	Normally open, normally closed, directional control, multi-purpose	Normally open, normally closed, directional control
Construction	Stainless steel body Stainless steel internal parts	Stainless steel body Stainless steel internal parts	Zinc die-cast body Stainless steel internal parts	Forged naval brass body Stainless steel and brass internal parts
Body Pipe Connector	1/8 and 1/4 NPT	1/8 NPT	1/4 NPTF	3/16", 1/8", 1/4" NPTF

When you specify solenoid valves, specify Skinner. Skinner solenoid valves are distributed nationally.

For complete information, contact a Skinner Representative listed in the Yellow Pages or write us at the address below.

SKINNER ELECTRIC VALVES

THE CREST OF QUALITY

SKINNER ELECTRIC VALVES

SKINNER ELECTRIC VALVE DIVISION,
THE SKINNER CHUCK COMPANY • NEW BRITAIN, CONNECTICUT

NATIONAL LOCK FASTENERS

to your "specs"

National Lock Company sales engineers will work with you in solving all your fastener problems. Our extensive engineering and production facilities are geared to handle your requirements for special-purpose or standard fasteners of uniform quality . . . delivered on time.

Write us.

"KEPS" ® REGISTERED TRADEMARK OF ILLINOIS TOOL WORKS

NATIONAL LOCK COMPANY
FASTENER DIVISION ROCKFORD, ILLINOIS

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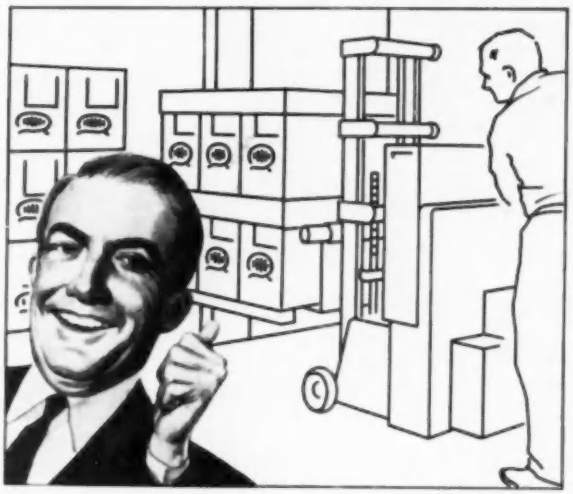
DO YOU USE HOSE CLAMPS BY THE CARLOAD?



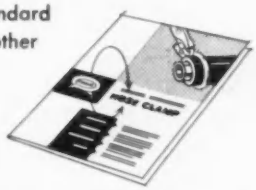
You can count on CORBIN!

Your hose clamp needs are in safe hands at Corbin! Production is geared to meet volume requirements. And ample stocks are kept in reserve for quantity shipments on any standard size within 24 hours in emergencies. For *dependable* hose clamp supply — by the carton or the car load — count on Corbin . . . makers of the original self-tightening hose clamp . . . the world's leading hose clamp supplier!

you get all this from CORBIN...

- ✓ **PROVEN PERFORMANCE** — Used by many leading manufacturers since first introduced
- ✓ **VOLUME SUPPLY** — Corbin is the world's leading hose clamp supplier — the *safe* source for volume users
- ✓ **SCHEDULED DELIVERIES** — Shipments systematically geared to your production schedule
- ✓ **RESERVE STOCKS** — Emergency needs are promptly met from continuously maintained reserves
- ✓ **ALL SIZES** — More standard maker sizes than any other

Write for Fact Folder HC20 and Size Specification Sheet



CORBIN

CORBIN HOSE CLAMP DIVISION
THE AMERICAN HARDWARE CORPORATION
NEW BRITAIN, CONNECTICUT

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Yoder Rotary Slitters reduce inventory... speed production

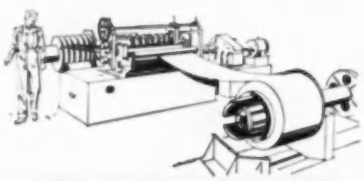
To help meet the demands of tight production schedules, YODER Slitters reduce mill-width stock quickly and economically to desired widths. If your needs are as low as 100 tons per month, time and manpower savings alone will offset the cost of your YODER Slitter in a matter of months, while reducing basic inventories. Compactly designed, standard YODER Slitters are built to handle standard coil widths... completely engineered lines for special requirements.

YODER accessories, such as coil cars, swivel unloaders, scrap choppers, scrap disposers, plate levelers and coil boxes, make stock handling fast and easy.

YODER also makes a complete line of Cold Roll-Forming equipment and Pipe and Tube Mills. To profit from YODER'S years of engineering and service experience, contact your local YODER representative or send for the YODER Slitter Manual.

Investigate the many advantages of YODER-engineered Slitter Installations. Write today for this comprehensive, 80 page YODER Slitter Manual... it's yours for the asking!

THE YODER COMPANY
5553 Walworth Avenue • Cleveland 1, Ohio



YODER ROTARY SLITTING LINES

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Observations

By Joseph Geschelin

Safe Driving

The drive for safety appliances on motor cars stalled some time ago due to the apathy of the public. Even if seat belts were made compulsory it would be difficult to get people to use them. It's much like the old saw about leading a horse to water. There is one safety device, however, that should be a must for those who drive at night. We refer to the automatic headlamp dimmer. We have a friend who is producing and selling such a device at fairly reasonable cost and it is claimed to have some exceptional features. They have taken an unusual selling approach. Instead of stressing the dimmer function they say the device gives the driver more mileage on his high beam. And that is the important thing when driving in darkness.

1961 Cars

Due to the timing of the National Auto Show in Detroit most makes of 1961 cars will have to complete their public announcements—and previews—by the first of October. A few may release models only at the Show; and we know of one car that may not be released until after the show. In any event, this year it means that your editor will be busy on new products beginning with the first week in June.

Better Mufflers

The fact remains that mufflers and tailpipes constitute a costly problem for the car owner. For our part we would be willing to pay a premium for a long-lived muffler, maybe all stainless steel, as part of the initial cost of the new car. Any reasonable extra cost would be returned in the first two or three years of driving. That is why we believe that muffler and tailpipe producers—also suppliers of heat resistant materials—are missing a bet in not concentrating on selling not only to the public but to the motor vehicle producers as well. This is one thing that is a real public service.

Cutting Fluids

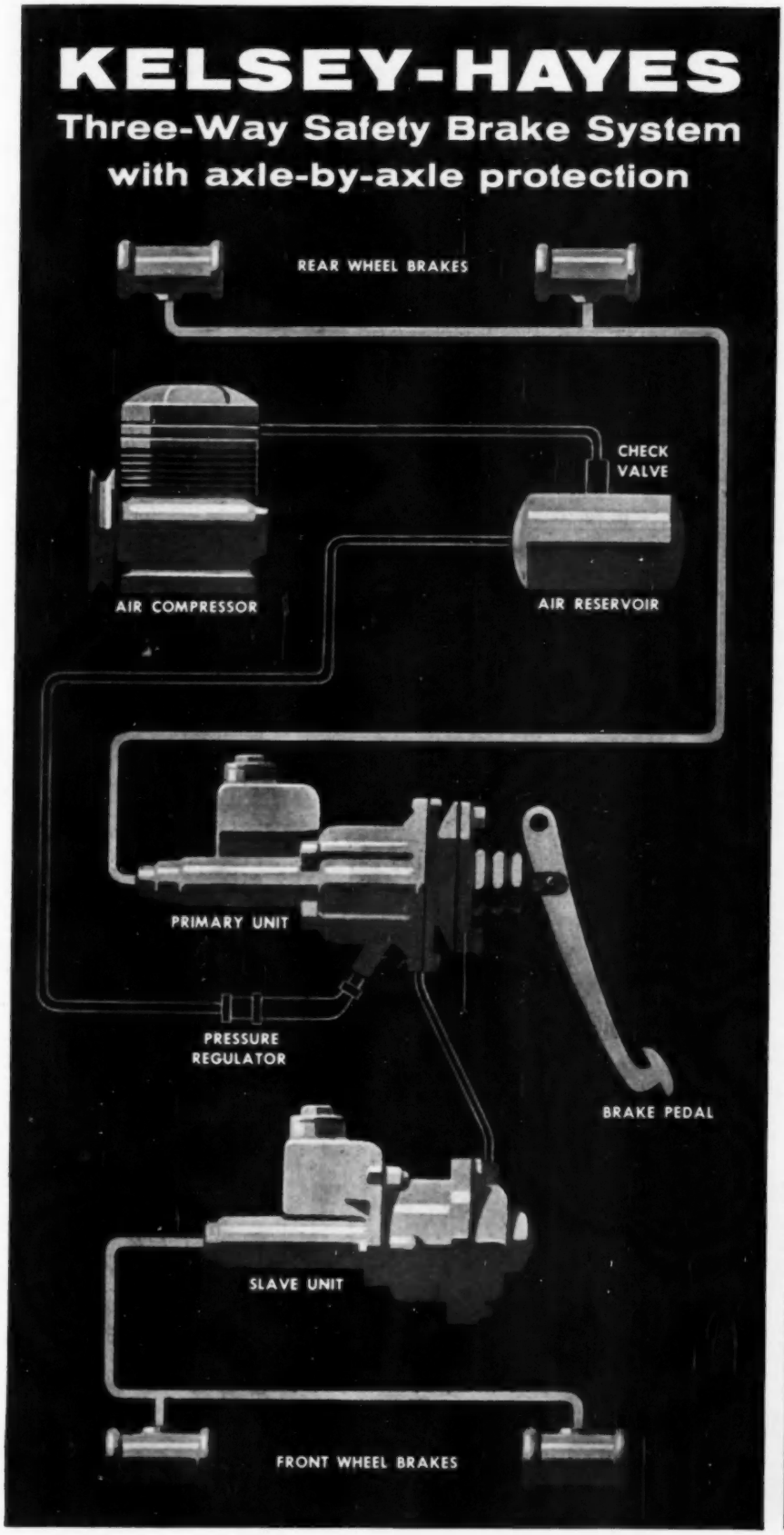
Few people in management have time to understand the proper function of the cutting fluids employed in chip production. This despite the fact that automotive plants alone consume millions of gallons of such materials per year. There is much to be gained in real money in reducing the number and types of cutting fluids used in a plant. There is much to be said too as to the savings resulting from the proper selection of these materials. What is needed immediately is a national survey of practice to guide further study. This writer is planning an attack on the problem at the coming ASTM national meeting with a follow-up before several influential user groups. We hope something tangible will come of it.

Business Problems

Prohibitive labor rates and high local and state taxes are literally driving manufacturers out of locations such as Michigan. What is much more serious, however, is that many large companies, including machine tool builders, parts suppliers, and producers of heavy machinery such as tractors are building plants in Western Europe, more recently in the Common Market areas, and in Puerto Rico. A trickle for the moment, this trend, if it grows, can ultimately mean less employment as well as a leveling of the standard of living. This is

KELSEY-HAYES

Three-Way Safety Brake System with axle-by-axle protection



this new concept consists of two independent air-actuated hydraulic systems, both of which are operated by the master unit.

1 If rear hydraulic line or wheel cylinder fails—you still have full front brakes with their own power assist!

2 If front hydraulic line or wheel cylinder fails—you still have full rear brakes with their own power assist!

3 If air supply should fail—you still have direct mechanical actuation of full rear brakes!

Write for "Three-Way Safety Brake System" brochure. Kelsey-Hayes Company, Detroit 32, Michigan.

KELSEY HAYES COMPANY

Automotive, Aviation and Agricultural Parts
Hand Tools for Industry and Home

16 PLANTS: Detroit and Jackson, Michigan; Los Angeles; Philadelphia and McKeesport, Pennsylvania; Springfield, Ohio; New Hartford and Utica, New York; Davenport, Iowa; Windsor, Ontario, Canada.

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something that should engage the attention of labor leaders and industrialists as well.

Cooling System

Developments have suddenly erupted in the anti-freeze situation. Some of this stems from corrosion problems due to the use of unsuitable make-up water in various parts of the country; some of it anticipates the special precautions that may be necessary with aluminum engines. In addition to the familiar packaged materials such as permanent anti-freeze and high boiling point alcohols, we now have a special packaged material used as a complete fill without water additions, and one that tolerates water additions. The first of these is good for one year, the latter is said to last indefinitely. Our feeling is that the owners of old cars, whether the first owner or not, will buy the lowest priced winter protection. The market for the new high priced materials appears to us to be in new cars and in fleets. For example, a normal year should produce 6-million cars more or less. If the factories could be sold on the advantages of a high-priced permanent cooling system material and if they could be induced to use this when shipping new cars, that would constitute an enormous new market. And we believe that the first owner would be glad to pay the difference. The fleet operator, on the other hand, is highly sensitive to cost of operation. No matter what the age of the vehicle, so long as it is in service it is more economical to pay extra for a long-lived anti-freeze than it is to buy a lower priced product and have to tie up an expensive vehicle twice a year to make the change. It will be interesting to see the public response to the higher priced anti-freezes come next September.

Light Metals

We have mentioned on occasion the major shift to aluminum and magnesium for functional structural components. There will be more of this on 1961 models what with the expected introduction of at least two or three all-aluminum V-8 engines. In fact the die-casters and producers of die-casting and permanent mold equipment are facing a boom. That those involved have recognized this rapid shift is best testified by the emphasis upon die-casting at the AFS Show in Philadelphia in May; and the National Die Casting Exposition billed for Detroit in November.

Better Products

This is intended to arouse some enthusiasm for an industry-wide program of reliability. At General Motors, the program has been sparked by vice-president Skinner. A sampling of what has been started recently will be found in the Reliability setup at the Rochester Products Division (see AI, April 1, 1960) pointing up what a part maker needs to do. A similar study at Buick appears in this issue.

Briefly, the aim is to get vehicles

SETKO self-locking set screws . . .
WIN FOR YOU EVERY TIME!

FREE "selector chart" shows complete line. Gives over 1,001 possible combinations. Write for your copy and test samples. Send your specifications for recommendations.

SETKO Set Screw & Mfg. Co.
16 Main Street, Bartlett, Illinois
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We specialize in solving puzzling screw problems!

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Thousands of users know FITZGERALD Fused-Aluminum Steel and Asbestos GASKETS end costly gasket failures

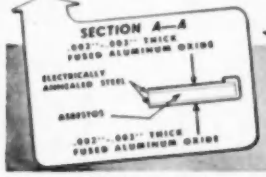
Specially designed, ruggedly built, to give a lasting, perfect seal in high compression engines, gasoline or diesel.

There's a Fitzgerald Gasket for Every Engine

Grease Retainers

Cork Gaskets

FITZ-Rite Treated Fiber Gaskets for oil, gasoline and water connections



A—A THE FITZGERALD MANUFACTURING CO.
Torrington, Connecticut

FITZGERALD gaskets SINCE 1906

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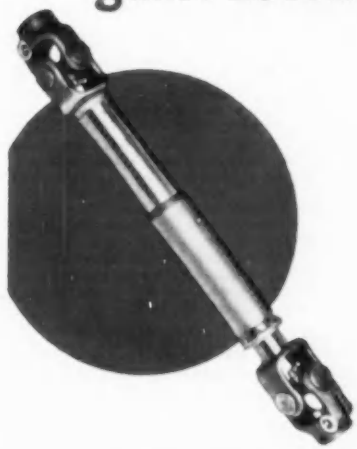
BLOOD BROTHERS jointed steering assembly guides giant LeTourneau-Westinghouse coal hauler!



No matter how large the equipment you design, there's a Blood Brothers steering or jointed driving assembly big enough to do the job. One example of the use of Blood Brothers components on large equipment is the L6S Steering Assembly on the LeTourneau-Westinghouse Haulpak Coal Hauler.

This mammoth, highly maneuverable "mountain mover" is a bottom-dump 450 h.p. diesel unit that weighs 37 tons. Yet it carries 2½ *times* its own weight in payload, or the equivalent capacity of over one and one-half standard 50-ton railroad cars!

Rockwell-Standard's Universal Joint Division offers you a wide range of specialized engineering experience—involving everything from manual steering assemblies . . . to power take-off drives . . . to heavy-duty propeller shafts. Whatever size and type equipment you manufacture, Rockwell-Standard can save you time, money – help you achieve higher standards of performance. Let us prove it—on your project!

Write for complete information

Another Product of...

ROCKWELL-STANDARD CORPORATION

ROCKWELL R STANDARD

Universal Joint Division, Allegan, Michigan

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DYKEM
STEEL BLUE
Stops Losses
making Dies and Templates
DYKEM STEEL BLUE
SPECIMEN
With DYKEM Steel Blue
Without DYKEM Steel Blue
Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2301L North 11th St. • St. Louis 6, Mo.

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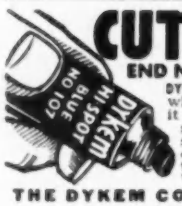

CUT SCRAPER TIME

END NIGHT CLEANUP & MORNING REBLUING

DYKEM HI-SPOT BLUE No. 107 is used to locate high spots when scraping bearing surfaces. As it does not dry, it remains in condition on work indefinitely, saving scraper's time. Intensely blue, smooth paste spreads thin, transfers clearly. No grit; noninjurious to metal. Uniform. Available in collapsible tubes of three sizes. Order from your supplier. Write for free sample tube on company letterhead.

THE DYKEM CO., 2301-L NORTH 11TH ST., ST. LOUIS 6, MO.

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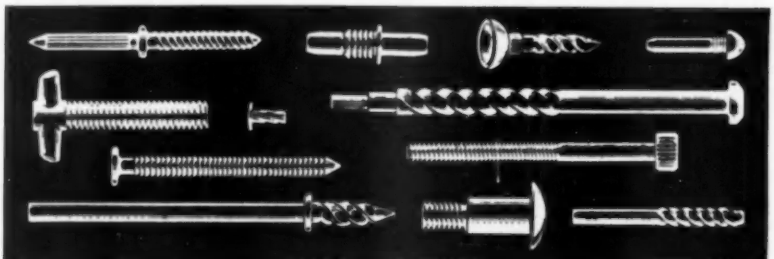
BUY BONDS

AUTOMOTIVE INDUSTRIES Goes into Leading Plants in the Automotive and Aircraft Industries

in the hands of owners that for the most part will not require correction of the many troubles that usually occur during the break-in period. By the same token, if this thing works, it will mean a major reduction in warranty costs. Car owners have been up in arms for some years on this score. It has resulted in shifts from a dealer and shifts from one make to another. It has been somewhat like going from the frying pan into the fire—until now.

Chemical Advances

In the chemical field, particularly in rubber, there is a striking growth in the development of polymers and monomers. Recently, Dr. L. M. White of U. S. Rubber noted that the overall growth of the polymer business is at the rate of about six per cent per year.



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Hassall

Here is a fast, dependable, low cost, quality minded source of supply for JOB-DESIGNED threaded parts and fasteners of all types, in any metal, to fit your own particular assembly problem. Recognize the fact that a fastener designed specifically to fill a seemingly complex assembly requirement can easily cost less than design modification to accommodate so-called standard rivets. Assembly costs are a very major part of manufacturing expense. Most of this is labor. The fastening medium itself is usually a minimum item. If a Job-Designed fastener makes assembly simpler and faster, permits the use of fewer fasteners, allows the designer functional freedom and improves product efficiency, yours is a specifying job well done. All these possibilities are available when you come to Hassall for design assistance and quotation on challenging, difficult or unusual rivets, threaded nails, drive screws and other cold headed parts. Short or long runs, pilot quantities, engineering counsel, over 100 years of intimate association with cold heading—and a deep appreciation and regard for the concept of value analysis—all are a part of the Hassall service to you.

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BOOKS...

FOUNDRY ENGINEERING, *by H. F. Taylor, M. C. Flemings and J. Wulff, published by John Wiley & Sons, Inc., 440 Fourth Ave., N. Y. 16, N. Y. Price, $9.75.* The writers stress fundamental concepts that apply to all cast metals. Broad in scope, the volume covers such pertinent matters as refractories, casting processes, melting equipment and practices, sand reclamation and control, welding, and heat treating. Particularly outstanding are the discussions of solidification and structure of cast metals, and principles of correct gating and risering of castings.

THE INTERNAL COMBUSTION ENGINE IN THEORY AND PRACTICE, *by Charles Fayette Taylor, published by The Technology Press, Massachusetts Institute of Technology and John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $16.00.* Volume I of a two-volume work is a product of the author's many years of research and industrial experience. Thermodynamic analyses are based on the characteristics of actual fuel-air media, and include convenient methods of comparing actual thermodynamic performance with ideal limits. A new and unique feature is the treatment of two-stroke and four-stroke air capacity. A treatment of engine friction is similarly new and complete. Both are based on extensive research at M. I. T.

KAISER ALUMINUM FOIL, *by John W. Knight, Technical Publications Dept., Kaiser Aluminum & Chemical Sales, Inc., 919 N. Michigan Ave., Chicago 11, Ill.* Request must be made on company letterhead; personal copies available at $12.50 each. Aluminum foil converting processes are described in detail and many end uses are reviewed in 244-page technical book. It is designed to suggest to management and sales staffs new foil products, as well as efficient production methods for traditional foil items.

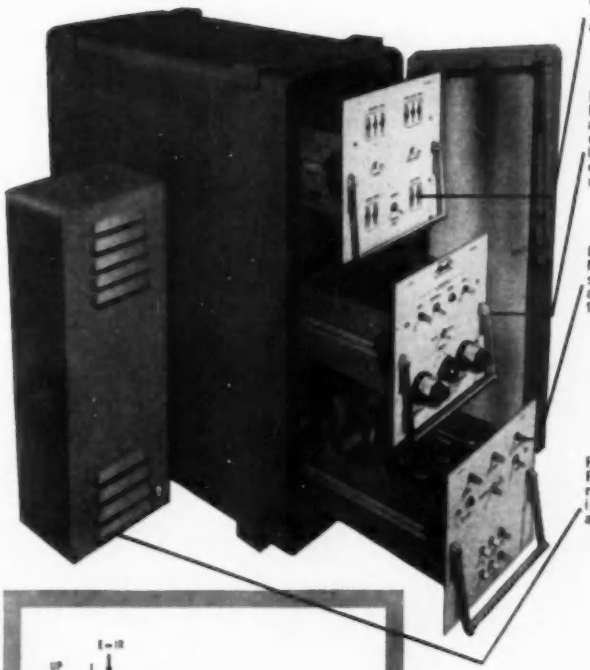
Monautronic V-2 welding control certifies weld quality... cuts rejects and production costs

A resistance welding control that automatically compensates for every process variable

The new Monautronic V-2 welding control introduces the concept of feedback control to produce spot-welds of consistently high quality. It makes use of the latest advances in electronic computing to overcome automatically such obstacles to weld quality as line voltage fluctuation, electrode wear, variations in electrode tip force, surface finish and shunting.

The Monautronic V-2 compensates for undesirable variations usually encountered in resistance welding by maintaining voltage across a weld at a constant value. This constraint of voltage amounts to constraint of final weld temperatures, and such temperature control assures production of quality welds.

- **Automatic lockout**—occurs when process variations are so severe that the available current range would not cover the requirements for quality welding. The control detects extreme contamination, failure in the force system, overwelding, poor matching or fitup, and any other conditions that would result in substandard welds.
- **Automatic sequencing**—all provisions for single spot, roll spot or seam welding. Sequencing is 100% accurate, and exceeds NEMA standard specification 3B. Special sequence programming is available.
- **Transistorized design**—for high reliability, compactness, low power consumption.
- **Modular construction**—permits easy removal of the three modules and separate firing unit, simplifies maintenance.
- **Shock and vibration resistant construction**—for long, reliable service in even the most demanding applications.
- **Safety interlock**—for protection of personnel during tip dressing.
- **Tamperproof case**—prevents access to control by unauthorized personnel.


SEQUENCE MODULE—Utilizes digital pulse-type circuitry . . . provides 100% accuracy.
HEAT CONTROL MODULE—Contains automatic and manual heat controls plus lockout devices. Processes input information from weld.
POWER SUPPLY MODULE—Power supply plus required auxiliary safety features.
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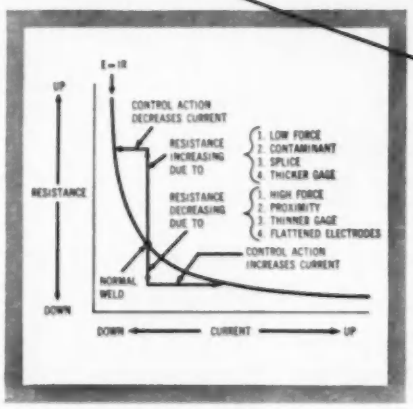

VOLTAGE CONSTRAINT

Graph shows how voltage control compensates for process variations. Any point on curved line E = IR represents a specific voltage. With normal weld as reference point, certain process variations cause increased resistance, while others cause a decrease. Control action is achieved through change of current to constrain voltage to same level for every weld.

for complete details contact: THE BUDD COMPANY
Electronic Controls Section • Philadelphia 32, Pa.

ELECTRONIC Budd CONTROLS

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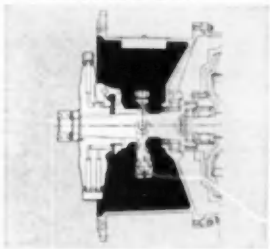
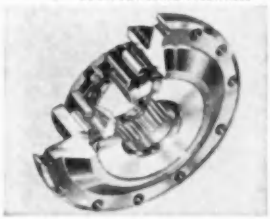
NEW From TWIN DISC . . .
Single-Stage Torque Converter
WITH DISCONNECT CLUTCH

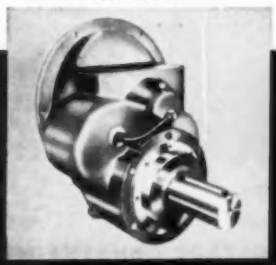
◇ "C" WITH FRONT END DISCONNECT CLUTCH (STANDARD)



◇ "O" WITH OVERSPEED OR BOOM-LOWERING FREEWHEEL



◇ "G" WITH 2:1 RATIO OUTPUT REDUCTION GEAR



IN THE APPLICATION of single-stage torque converters, Twin Disc's new *Model C* units provide considerable design flexibility. These clutch-equipped converters are offered in three input torque capacities: 350 lb-ft (1300 Series); 450 lb-ft (1500 Series Standard-Duty); and 650 lb-ft (1500 Series Heavy-Duty).

All Model C units feature an 11" front-end disconnect clutch—single-plate on the smaller series; two-plate for capacities above 350 lb-ft. Both clutches are mechanically actuated types with driving rings that fit standard SAE over-center flywheels.

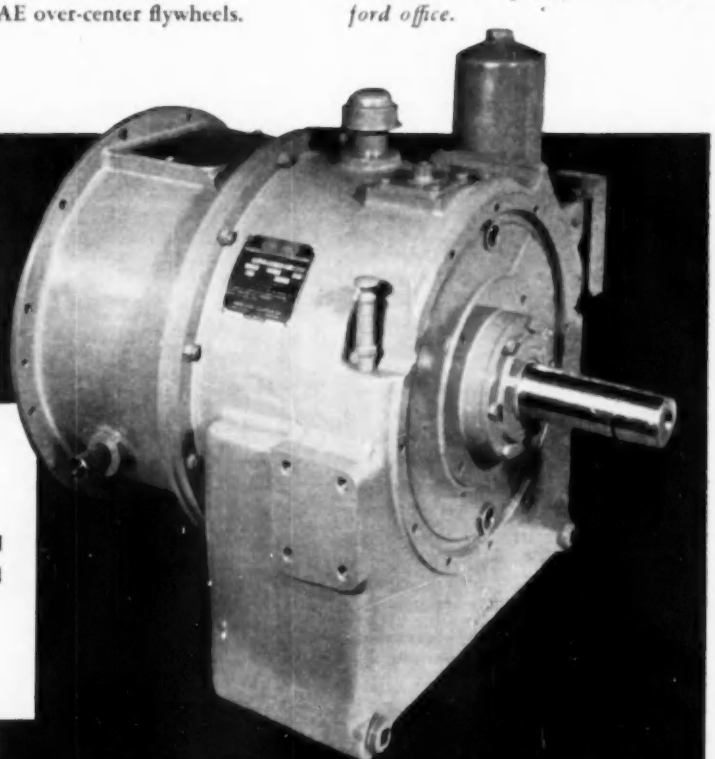
OPTIONAL
Boom-Lowering Freewheel

For the shovel and crane industry, Twin Disc has designed a special converter—*Model CO*—with a cam-and-roller freewheel between the impeller and the turbine. This permits the converter to function as a straight mechanical drive whenever the output shaft is driving. As the boom begins to fall of its own weight, the freewheel locks the turbine to the impeller, making engine friction horsepower available for braking.

OPTIONAL
Output Reduction Gear

For installations using high-speed engines but requiring lower output shaft speeds, Twin Disc can furnish a 2:1 ratio reduction gear. It bolts to the rear of all Model C and CO converters and is capable of carrying output shaft side loads. The gear can be mounted in the field without design change.

New Bulletin 510, containing engineering data on 25 models of Twin Disc Single-Stage Torque Converters, is available on request from our Rockford office.



TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC
Torque Converters

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • Hydraulic Division Rockford, Illinois

Circle 207 on Inquiry Card for more data

interchangeable with all standard JIC cylinders

CHECK THESE 10 POINTS OF T-J SUPERIORITY

1 One Piece Piston

2 Hard Chrome Cylinder Bore and Piston Rods

3 High Tensile Steel Tie-Rods

4 Cushion Adjusting Screw, Externally Adjustable

5 New Super-Cushion for air, or Self-Aligning Master Seal for Oil (T-J Patents)

6 Solid Steel Heads and Mounting Plates Standard all Models

7 Port Design Allows Minimum Pressure Drop on Inlet or Outlet

8 Chevron Type, Self-Adjusting Rod Packing

9 Piloted Packing Gland–Absolute Alignment

10 Piston Rod, Extra Strong–Polished and Chrome Plated for Efficiency and Protection

With the introduction of the ALL NEW T-J Squair Head, Tomkins-Johnson now offers industry the most complete design range of air and hydraulic cylinders. Presently available in bore diameters from 1½ to 8 inches, the T-J Squair Head is an interchangeable cylinder which produces maximum force and efficiency, with minimum pressures . . . and is also adaptable to the use of low pressure oil as the working medium. Write to The Tomkins-Johnson Co., Jackson, Michigan, for Bulletin #SQ 10-58 and complete details.

T-J TOMKINS-JOHNSON

Circle 208 on Inquiry Card for more data

HOW DOEHLER-JARVIS' DAY-TO-DAY SERVICE HELPS MELNOR MASS PRODUCE HIGH QUALITY LAWN EQUIPMENT

Melnor Industries, Inc., is the leader in garden sprinklers and related hose hardware . . . items designed to high mechanical standards, modernly styled, priced for volume sale.

From the start, most parts of most items in the Melnor line have been die cast by Doehler-Jarvis . . . for reasons that Melnor sums up in the simple phrase, "day-to-day service."

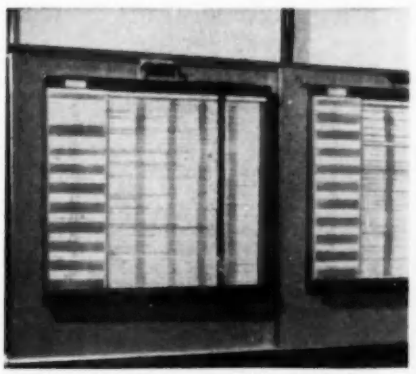
But this is a phrase that needs illumination, needs specifics.

Just what does Doehler-Jarvis include in this "day-to-day service" that means so much to die castings customers? As you might expect, Doehler-Jarvis provides all customary services, such as tapping, drilling, milling and other pre-assembly work. Doehler-Jarvis provides important extras, too . . . extensive assistance in parts design, for example, and complete finishing facilities. Even sub-assembly may be negotiated, if desired.

But more important than these is a sort of informal "partnership for production" . . . where key people in D-J keep in daily touch with their opposite numbers . . . with D-J's sales engineer coordinating all along the line. Through this mutual understanding and interchange of process knowledge, design is continually improved, costs continually reduced. Often difficulties are anticipated and entirely avoided by the close *personal* contact that exists at all working levels with Doehler-Jarvis customers.

Pictures at right show some of the points of contact . . . show some of the Doehler-Jarvis facilities that make this unique working relationship pay off for Melnor . . . as a comparable relationship might for you.

Close liaison during die design does much to keep Melnor's costs down. At this stage slight modifications in die or part often eliminate one or more operations. To attain this flexibility, D-J designs and makes its own dies.



Coordinated production is achieved simply. It's done by a daily telephone call that establishes Melnor's needs for the next two days.

Doehler-Jarvis

Division of
NATIONAL LEAD COMPANY
General Offices: Toledo 1, Ohio
Plants at:
Toledo
Grand Rapids 2, Mich.
Pottstown, Pa.
Batavia, N. Y.

In Canada: **Barber Die Casting Co. Limited**
Hamilton, Ontario

In Brasil: **Industrias Doehler do Brasil, S.A.**
Sao Bernardo do Campo, Sao Paulo

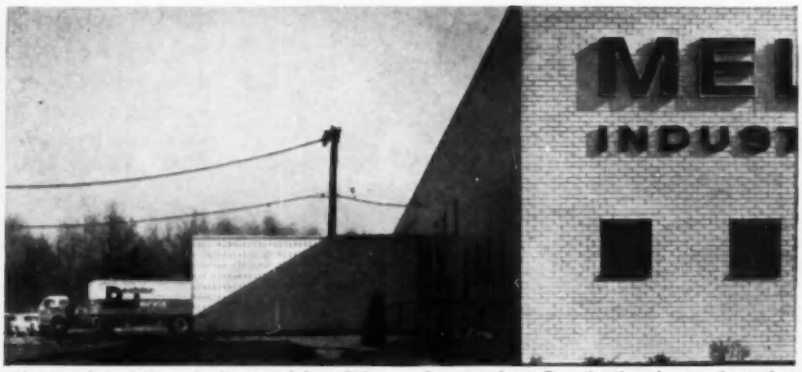
Idea exchange starts early! You are looking in on a tough-minded, sharp-pencil work session. At this one, Melnor and Doehler-Jarvis decision makers are setting basic production requirements for a new sprinkler model. During production informal meetings between individual members of this group will keep production moving smoothly.

Joint meetings establish production cost limits. Then D-J automates to bring costs within requirements. Ordinarily, automatic tooling is developed and made in Doehler-Jarvis' own shops... as was this 12-station, indexing tool.

Two heads have proved better than one in giving Melnor products durable low-cost finishes, so specialists from both companies confer frequently. D-J both plates and paints. Modern inspection guards finish quality.

Mutual considerations bring packing innovation. Until recently, D-J shipments went to Melnor in throw-away packages. To save money and time at both plants, D-J engineers designed the money-saving re-use container above.

Before closing, D-J has its trucks loaded for the next day's delivery and has started preparing shipments for the succeeding day.



Plant-to-plant delivery is direct and fast. Shipments to Melnor go in one or more of Doehler-Jarvis' own tractor-trailors, arriving early in the morning. Coordination is so close that neither plant is called upon to carry high parts inventories.

Constant Ratio

Variable† Ratio

†Originated and developed by Ross

● Wherever the job calls for alert, responsive, fatigueless steering . . . Ross *variable-ratio* steering is at its best!

Ross *variable-ratio*—faster steering and quicker recovery for turns, and slower steering and greater stability for straight-ahead handling—has been adopted by 31 of today's leading vehicle manufacturers. Ross invites *your* inquiry.

Ross STEERING

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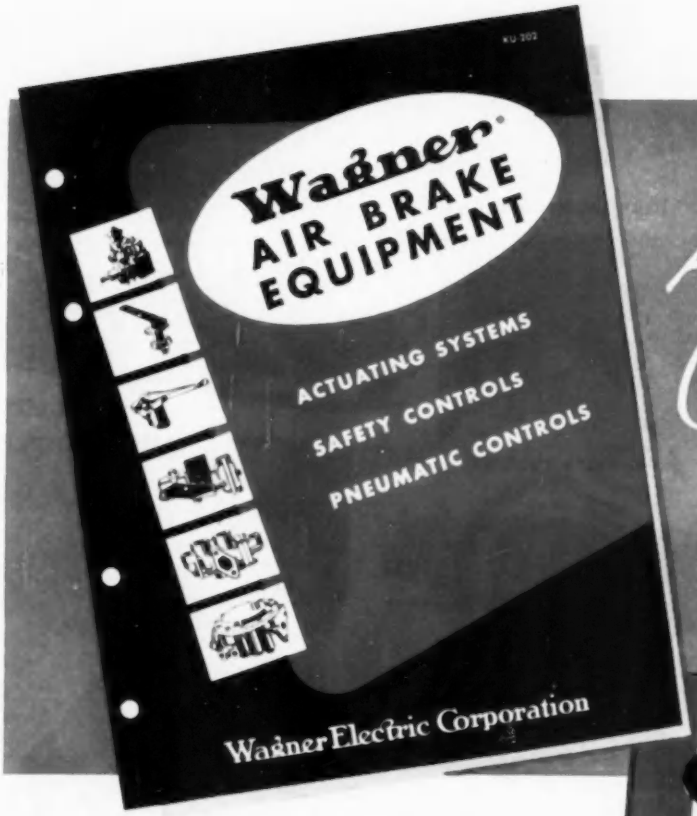

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is complete...and readily available

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ACTUATING UNITS
MOISTURE EJECTION VALVE
WARNING DEVICES
AIR TANKS... HOSE
AIR LINE CONNECTORS

Keep a Wagner Air Brake Equipment Manual handy for use when specifying or ordering air brake systems—actuating systems . . . safety controls . . . pneumatic controls.

This sales manual (KU-202) was produced specifically to aid design engineers, purchasing and production engineers of original equipment manufacturers. It outlines the uses, operating and construction characteristics, and dimensions of standard Wagner Air Brake units. A wide range of standard units for vehicular or industrial uses are listed by parts number. They may solve your braking or air control problem.

CONSULT YOUR WAGNER AIR BRAKE SPECIALIST

Let him help you with your specifications, and also ask him about the engineering consulting service available from Wagner.

Wagner Electric Corporation

6363 Plymouth Avenue, St. Louis 33, Mo., U. S. A.

WK60-B

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WAUKESHA TRANSPORT ENGINES

up to 400 HP

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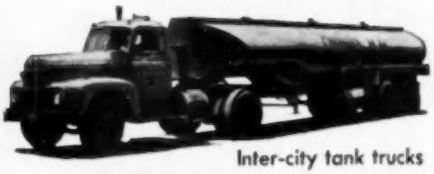
Heavy-duty hauling

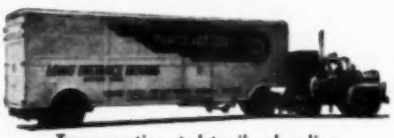
Steep-grade transport



Inter-city tank trucks

Fire Fighting equipment

Snow plows and trucks



Transcontinental trailer hauling

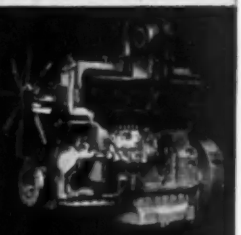
Power for extra-heavy loads

Off-the-highway service

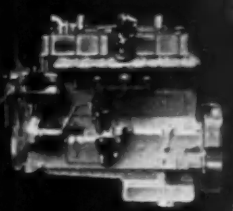
Overland freight routes

466

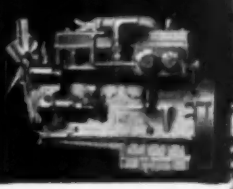
WAUKESHA WAKDBS TURBOCHARGED DIESEL . . .
6¼x6½" bore and stroke, 1197 cu. in. displ., up to 400 hp. at 1800 rpm.



WAUKESHA 145-GZB HIGH OUTPUT GASOLINE ENGINE
5½x6" bore and stroke 817 cu. in. displ., up to 268 hp. at 2400 rpm.



WAUKESHA WAKB BUTANE-PROPANE ENGINE
6¼x6½" bore and stroke, 1197 cu. in. displ., up to 300 hp. at 1800 rpm.



DIESEL
GASOLINE
BUTANE
ENGINES

EXCEPTIONAL PLANT FACILITIES
25 ACRES OF MANUFACTURING SPACE

Write for descriptive literature

WAUKESHA MOTOR COMPANY
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DOW | MAGNESIUM

MAGNESIUM DELIVERS MORE DIE CASTINGS PER POUND!

6 pounds of magnesium make...

6 pounds of aluminum make...

6 pounds of zinc make...

This means you're getting substantially *more* for your money when you choose magnesium die castings. You get more *volume* per pound! You get more die castings per pound! Reason: aluminum is 50% heavier than magnesium–zinc is 4 times heavier.

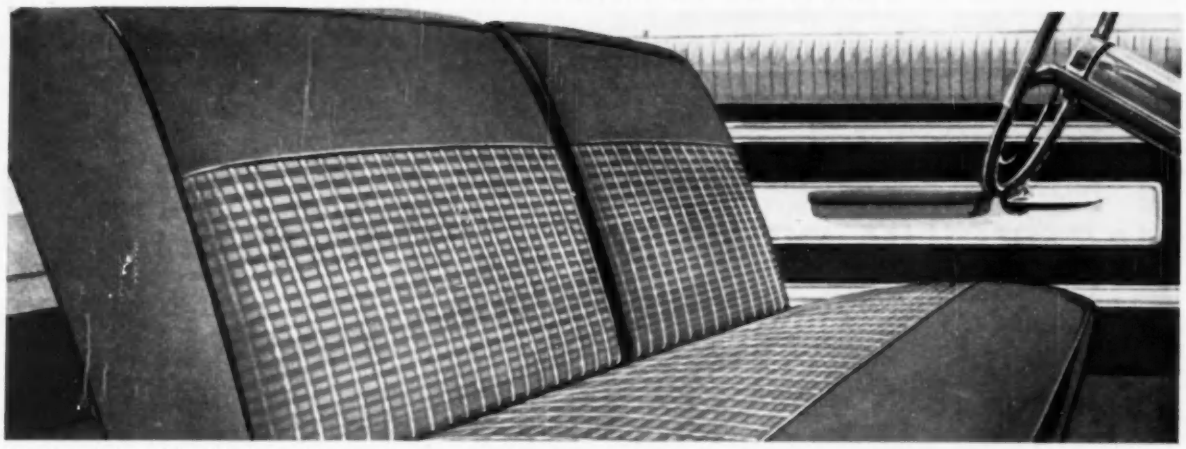
You save on production costs, too, because magnesium can usually be die cast 50% faster than aluminum. This means that 2 die casting units can produce as much as 3. Magnesium can be machined faster too, with less wear on tools.

Save all three–weight, production time and manufacturing costs–and get more die castings in the bargain by choosing magnesium for your die cast components! For more information check with your die casting supplier or write to: Automotive Development Engineering, Magnesium Sales Department, 1101T5-15, THE DOW CHEMICAL COMPANY, Fisher Building, Detroit, Michigan.

Remember . . . magnesium gives you fast production! The fact that magnesium can be die cast faster means you not only get more die castings per pound with magnesium, but you get more flexible production schedules, too!

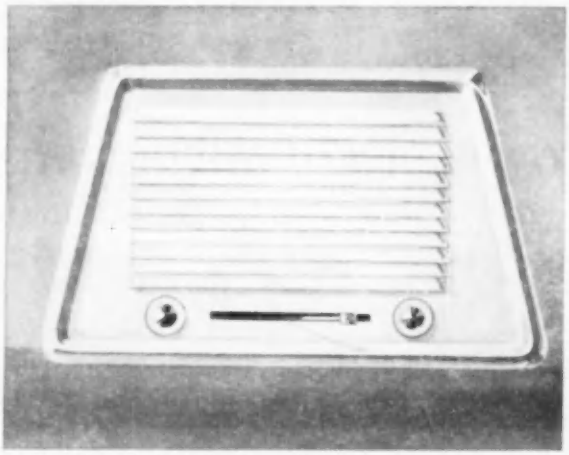
See the "DOW HOUR of GREAT MYSTERIES" on NBC-TV

THE DOW CHEMICAL COMPANY · MIDLAND, MICHIGAN



No Fugitive Plasticizers! Seat covers made of Escon polypropylene monofilaments do not emit fugitive plasticizers to fog windshields like many other synthetic upholsteries. In addition, these seat covers hold their shape as well as color...won't fade or bunch with repeated use. Other Escon properties include excellent impermeability to odor; good chemical and abrasion resistance; low density for more yardage per pound; and high tensile strength.

Sparks Cost Cuts! Escon exhibits high dielectric strength at all frequencies measured...provides a generous volume yield...allows finest detail in mold design. This makes Escon ideal for distributor caps, cable connectors and other under-the-hood parts.



Pure Punch Resistance! Some grades of Escon possess greater impact strength and hardness than many other thermoplastics...desirable properties in such items as air-conditioning grilles, heater grids, knobs and closures. Fast production cycles with Escon are another plus value.

Escon® POLYPROPYLENE SETS A NEW

Tomorrow's best-selling cars may well contain parts made of Escon. For example, as dashboard panels, its color matching qualities with high surface gloss and exact molding detail allow new design freedom – not possible with many other thermoplastics. Used for steering wheels, its impact strength and rigidity guard against cracking—a big safety feature! Steering wheels made of Escon won't absorb body odors either. Other suggested interior uses include kick plates, arm rests, sun visors and grilles—just to mention a few.

ENJAY PLASTICS

EXCITING NEW PRODUCTS

ENJAY COMPANY, INC., *15 West 51st Street, New York 19, N.Y.*

STYLE FOR TOMORROW'S CARS

The automotive engineer will benefit greatly from Escon since it exhibits heat resistance up to 250° F., and shows resistance to oils, acids and solvents. This will make it ideal for many under-the-hood parts.

From every angle, Escon promises exceptional benefits. It offers manufacturers big economy because polypropylene's low density allows more pieces per pound. It offers car owners new comfort and safety features plus new beauty in design.

For technical assistance or to order Escon, contact the Enjay office nearest you.

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Producers of alloys, metals and chemicals

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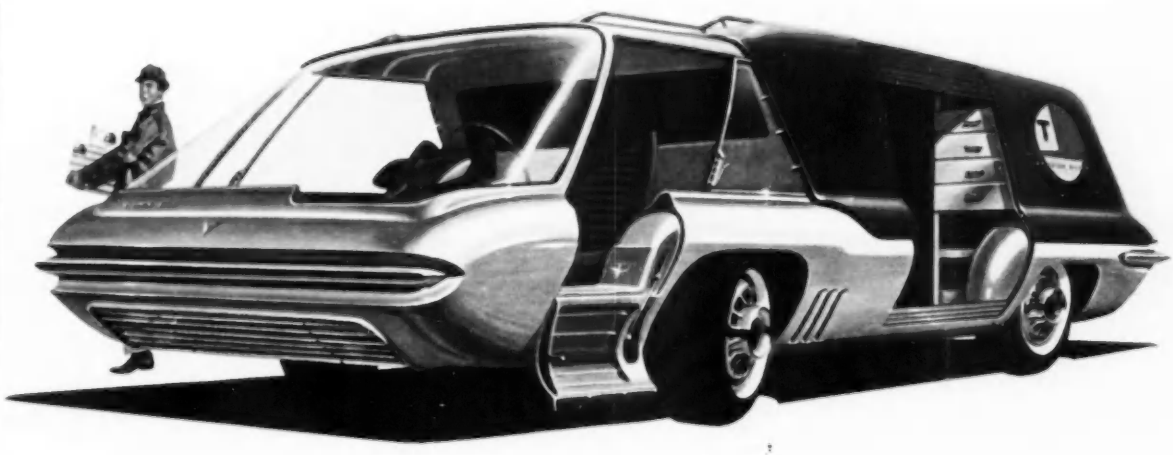
Circle 216 on Inquiry Card for more data

stainless steel

No other metal has the strength, beauty and versatile qualities that serve you so well today and promise so much for tomorrow.

There is nothing like stainless steel for THE AUTOMOTIVE INDUSTRY



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Detroit 17, Michigan

Manufacturers of high quality Stainless and Carbon Steels

Look for the **STEELMARK** on the products you buy.

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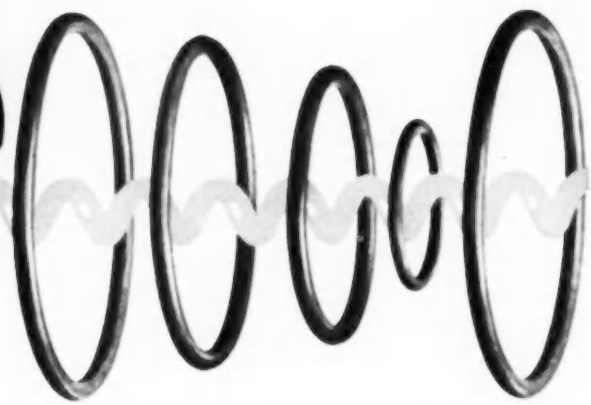
Call your National Applications Engineer for

engineering help
fast delivery
uniform quality
special compounds
on O-Rings



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Division, Federal-Mogul-Bower Bearings, Inc.
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6342

Cooling off hot problems—

24 successes in 24 attempts...and ready for the 25th

Automotive air conditioning manufacturers have come to think of us as helpful *control* specialis's in their highly specialized field.

Since 1953 that's been the case. Our engineers have been on the "hot spot," ironing out car air conditioning control and systems bugs in a hurry.

This same veteran technical task force has come up with 24 new cool-working solutions . . . designing and building thermostatic expansion valves, pressure regulators, drier-receivers and distributors shown above.

Whether a single component or the complete control package is the hot problem in your auto air conditioning, we'd like to make it our 25th challenge. And you get the follow-up economy of high-volume production plus the convenience of coast-to-coast jobber coverage for future replacements.

A note on your letterhead will bring fast action from Controls Company of America, Milwaukee 10, Wisconsin.

These independent automotive air conditioner and automobile manufacturers rely on Controls Company of America:

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AMERICAN MOTORS
FORD, MERCURY DIV.
ARA
CAPITOL
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CONTROLS COMPANY OF AMERICA

HEATING AND AIR CONDITIONING DIVISION

2415 N. 32nd Street, Milwaukee 10, Wisconsin • Cooksville, Ontario • Zug, Switzerland

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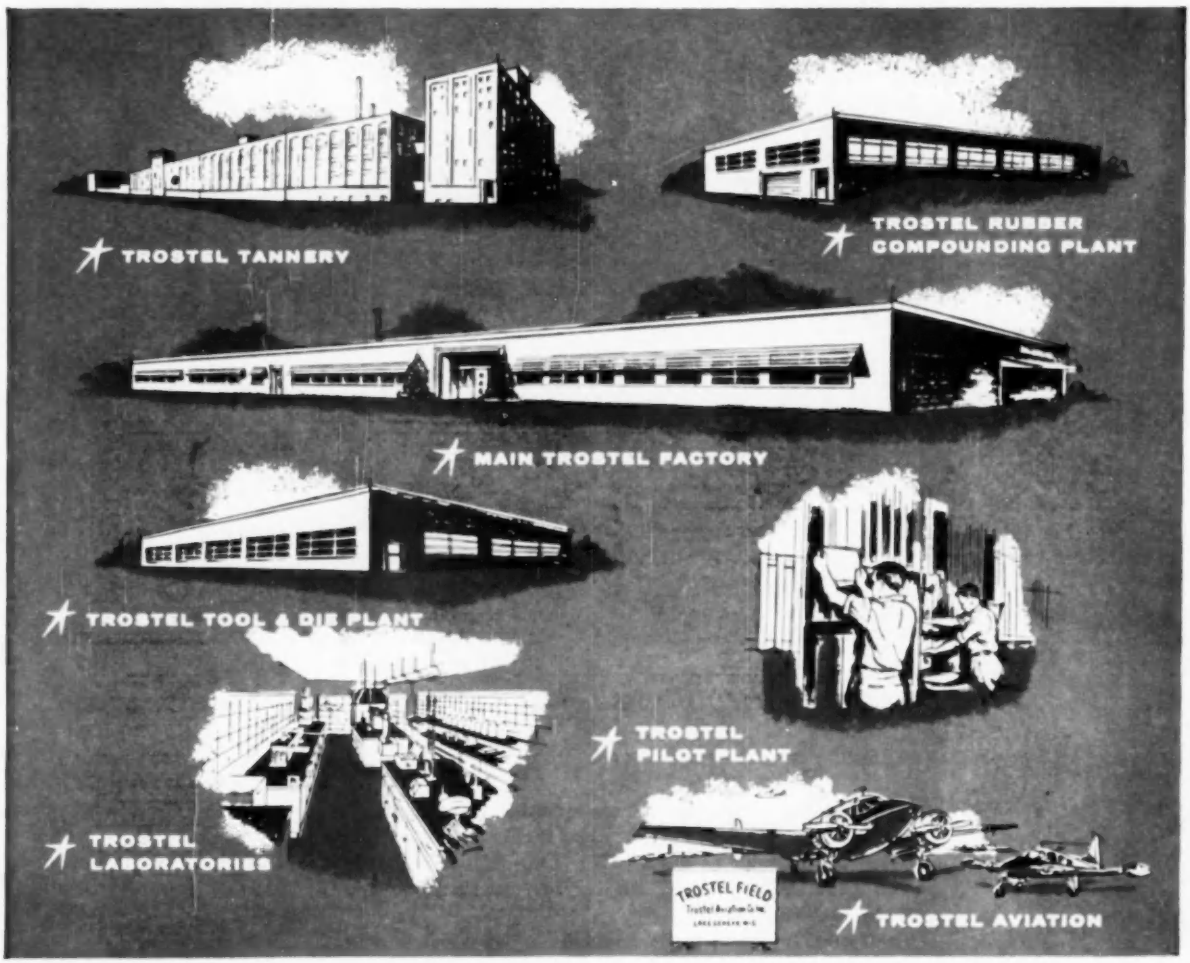
TROSTEL

A complete producing organization for

☆OIL SEALS ☆PACKINGS ☆O-RINGS



Quality in every phase of supply and manufacture is assured through Trostel ownership of all essential facilities

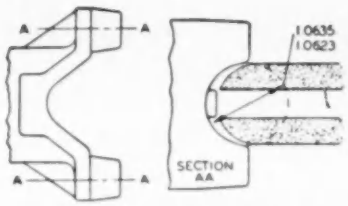
From raw materials to finished product, all key sources of supply and manufacture are Trostel owned and operated. Leather is tanned at the Trostel Tannery. Rubber is compounded at the Trostel Compounding Plant. Dies are made at the Trostel Tool and Die Works. Three separate Trostel Laboratories conduct research in leather, impregnations, and synthetics. A pilot plant tests all production runs. When, therefore, parts and materials arrive at the point of manufacture into seals and packings they are uniformly standard in specifications. Manufacture itself is by automatic machinery in a modern plant, with a quality control system that insures close-tolerance accuracy in all operations. Special delivery and service are provided by Trostel Aviation . . . we can come to you quickly, or bring you to us.

Trostel control of its products from raw materials to delivery is your guarantee of dependably high quality at all times, on every order. For catalog and technical data, write Albert Trostel Packings, Ltd., 800 Madison St., Lake Geneva, Wis.

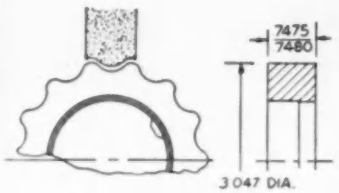
TROSTEL QUALITY SINCE 1858

PACKINGS
OIL-SEALS
O-RINGS

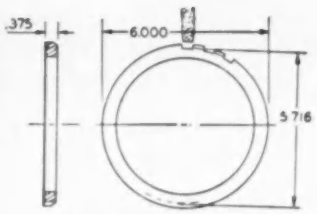
Circle 219 on Inquiry Card for more data



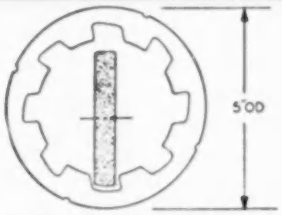
Job: Grind 2 half-rounds from rough
Part: Universal Joint
Output: 400/hr, floor to floor
Material: Pearl. Mall. Iron
Pcs/load: 10



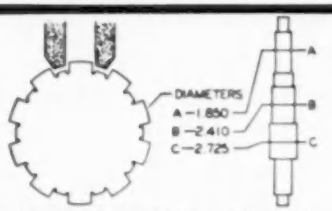
Job: Contour grind 14 lobes
Part: Pump rotor
Output: 88/hr, floor to floor
Material: Steel 200 Brinell
Pcs/load: 12



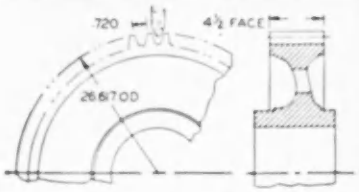
Job: Grind 24 teeth from solid
Part: Splined spacers
Output: 18/hr
Material: Steel
Pcs/load: 9



Job: Contour grind internal cams
Part: Roller clutch cam
Output: 60/hr
Material: Case hardened steel
Pcs/load: 2



Job: Straddle grind 3 sets of 10-splines (parallel sides)
Part: Transmission mainshaft
Output: 2.7/hr/spline set
Material: Steel 61-64 Rc
Pcs/load: 1

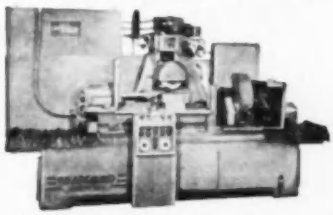


Job: Grind 94 teeth (.017" per side)
Part: Railroad gear
Output: 1.1/hr, floor to floor
Material: Steel 60 Rc
Pcs/load: 1

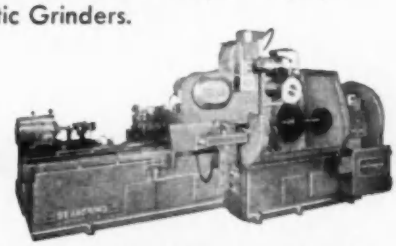
Now You Can Plan on FULLY AUTOMATIC FORM GRINDING

to cut costs, improve accuracy on external and internal contours

Here are some examples. You can do all these jobs—involute, cycloidal, spherical, etc.—at either high production or job-shop rates with top accuracy on highly versatile Detroit Automatic Grinders.

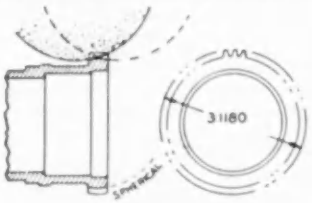


"Detroit" automatic contour grinder for up to 20" PD.

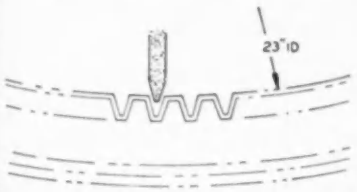


"Detroit" automatic contour grinder for up to 36" external and 30" internal.

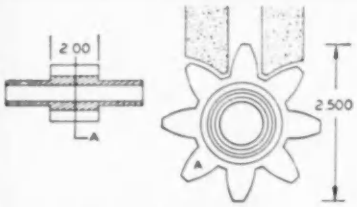
GEAR GRINDING MACHINES DIVISION
MICHIGAN TOOL COMPANY
7171 E. McNICHOLS ROAD • DETROIT 12, MICHIGAN



Job: Spherical grind 48 teeth
Part: Spherical gear coupling
Output: 2.3/hr
Material: Carburized 60 Rc
Pcs/load: 1



Job: Internal grind 157 teeth
Part: Aircraft reduction gear
Output: 1.2/hr
Material: Case hardened
Pcs/load: 1

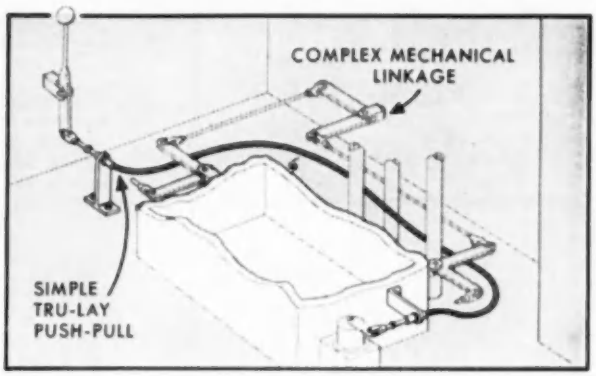


Job: Straddle grind 8 teeth
Part: After-burner pump gear
Output: 11/hr, floor to floor
Material: Nitrided steel 15N-90
Pcs/load: 1

Circle 220 on Inquiry Card for more data

TRU-LAY *PUSH*-PULL CONTROLS PROVIDE ACCURATE, DEPENDABLE REMOTE CONTROL FOR HUNDREDS OF PRODUCTS

• If your products involve remote control—electrical, hydraulic, pneumatic or direct—TRU-LAY PUSH-PULL FLEXIBLE CONTROLS can help solve your design problems. They provide positive remote control over long or short distances—up to 150 feet from the control point. Because they operate while flexing, they can snake around obstructions. They will not buckle. They are ruggedly constructed, easily installed and operated, sealed against dirt and moisture, and will handle jobs with as much as 1,000 lbs. input. PUSH-PULL CONTROLS are simple, have but one moving part, are noiseless, and give a lifetime of accuracy. Mechanical linkages, on the other hand, are complex. Unlike PUSH-PULL CONTROLS, they are made of many parts, wear at many points, and produce increased backlash, lost accuracy, and vibration rattles.



Sizes and Operating Heads to Fit Your Design

Control Dimension	Minimum Recommended Radius in Inches	Maximum Input Load in Pounds (Dependent on Travel)
3/32"	2	30
1/8"	3	65-125
3/16"	5	115-175
1/4"	6	300-600
5/16"	8	700-1,000

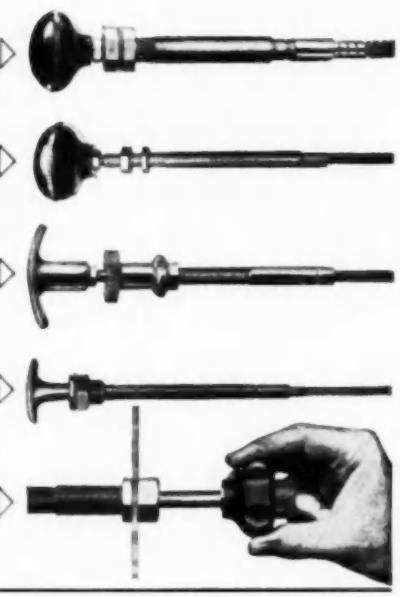
Heavy Duty • For use where rugged duty prevails, but where operation must be smooth and accurate. Meets all requirements for dependability and life.

Light Duty • Gives smooth, accurate and dependable performance at low cost. Available with your choice of several types of knobs.

Selective Friction • Amount of friction can be changed to meet individual requirements of the operator or application. Friction constant at any setting.

Position Lock • A slight turn of the T-type handle locks the control in any position. Available in two sizes for light and heavy-duty applications.

Micro Control • Push or pull the knob for instantaneous response, then rotate knob for vernier adjustment. Built for smooth, efficient operation on any job.



PUSH-PULL DATA FILE shows how to simplify, improve design

PUSH-PULL CONTROLS are solid as a rod and flexible as a wire rope. They're factory-lubricated for life, unaffected by temperature extremes, and can be adapted to practically any application. For complete details on how you can use them, write for the PUSH-PULL DATA FILE. It contains 7 engineering Bulletins which describe in detail the operation of PUSH-PULL CONTROLS, their applications, features and advantages. Our engineers will be glad to help you make TRU-LAY PUSH-PULL CONTROLS a part of your product.

PUSH-PULL CONTROLS

Automotive and Aircraft Division • American Chain & Cable Company, Inc.

601-H Stephenson Bldg., Detroit 2

6800-H East Acco Street, Los Angeles 22 • 929-H Connecticut Ave., Bridgeport 2, Conn.

ACCO

Circle 221 on Inquiry Card for more data

Geared with Fuller ROADRANGER... The Willett Company is using 61 Fuller-equipped GMC and International Tractors, operating from 5 terminals, for bulk hauling in the Chicago area.

Willett conquers city traffic and toll roads

"Our R-46 ROADRANGER Transmissions have achieved an excellent record," says Walter Neumann, Director of Purchases for The Willett Company, Chicago. "They help our drivers maintain fast trip times whether they're creeping in city traffic or running at top legal speed on the toll roads in our operating area.

"Our drivers really appreciate the 8 forward speeds with short, progressive steps between ratios, shifted with a single lever."

Willett uses 61 International and GMC Tractors equipped with semi-automatic R-46 ROADRANGERS for bulk hauling in the Northern Illinois-Northern Indiana area. Payloads for the bulk operation run as high as 50,500 pounds with the most modern trailers used by Willett.

Ask your truck dealer about the Fuller Transmission best suited to your particular operation.

FULLER — TRANSMISSION DIVISION — MANUFACTURING COMPANY
KALAMAZOO, MICHIGAN
Subsidiary EATON Manufacturing Company

Unit Drop Forge Div., Milwaukee 1, Wis. • Shuler Axle Co., Louisville, Ky. (Subsidiary) • Sales & Service, All Products, West. Dist. Branch, Oakland 6, Cal. and Southwest Dist. Office, Tulsa 3, Okla. Automotive Products Company, Ltd., Brock House, Langham Street, London W.1, England, European Representative

Circle 222 on Inquiry Card for more data

STRIPPIT SUPER 30 FABRICATOR

Larger work sizes for more efficiency...for short run punching — 30" x any length ... for production run hole duplication — 25" x 30".

Adjustable table for greater accuracy and flexibility...for punching to closer tolerances in angles, shapes and formed parts as well as flat sheets.

New, no-jam electric head eliminates down time...and the need for pressurized air. Fewer parts minimize maintenance — ensure quieter, more positive operation.

Wide range of hole punching capacities...from a 3½" hole (round or shaped) in 16 gauge to a ½" hole in ¼" mild steel.

Corner and edge notching...up to 5" x 5" in 16 gauge mild steel — 90° corners, rectangular, vee, radii and special shape edge notches.

Straight line nibbling and contour shearing...at 165-strokes per minute in ⅛" mild steel. Instant changeover from single stroke punching.

New swing-shift punch holders...quick-opening, positive-closing — for right or left-hand operation. Electrical interlock for safety.

Exclusive quick-change tooling system...using standard stock punch and stripping guide assemblies and die buttons. Size changes take less than 20 seconds.

New quick-set gauging system...with micrometer settings for fast, accurate layout and rapid work positioning.

EASY CONVERSION TO A PRODUCTION PUNCHING UNIT...

with the Strippit Duplicator which can be built-in as an integral part of the Super 30 Fabricator — and the Dupl-O-Scope for punching Duplicator templates from a drawing, layout or sample part.

WRITE TODAY... for complete details, illustrated literature, price and delivery.

A UNIT OF HOUDAILLE INDUSTRIES INC.

WALES **STRIPPIT** INC.

242 Buell Road, Akron, New York

In Canada: Strippit Tool & Machine Company, Brampton, Ont.

Circle 223 on Inquiry Card for more data

THE NEW PHENOLICS

Let your ideas for tomorrow take shape in a host of hard-working materials • When you're getting ready to break with tradition, take a look first at the *new* phenolics.

Then lift the hood. You'll find a lot of places where you can put today's phenolics to work.

They're huskier; impact strength is up—as high as 15 ft.-lb. per inch. They resist heat as high as 500°F. Electrical properties, always good, are still better now—and improving all the time.

Idea: Did you know you can get Durez phenolics designed specifically for wet-on-one-side, dry-on-the-other situations? Think what that might mean in terms of *noncorroding hose connectors.*

Idea: How about a low-cost *distributor bowl case* of medium-impact phenolic? A nonrusting enclosure for accessory motors? A phenolic *air cleaner bowl* that hushes rattle and vibratory hum?

Idea: Or consider what you could do with a Durez glass-filled phenolic that outlasts metal in *oil-pump gears* and *automatic transmission parts.*

Remember, too, that when you design with phenolics you almost always save money. They can save you the whole cost of machining and finishing a part. They're low in price, stable in price, always available.

These newer, harder-working materials come from Durez in hundreds of formulations—give you a variety and a versatility that let you dream a little. To put the touch of tomorrow in today's design, come to Durez for *plastics that take you where other plastics can't go.*

For descriptive Bulletin D400 or for help on a specific application, write us.

DUREZ PLASTICS DIVISION

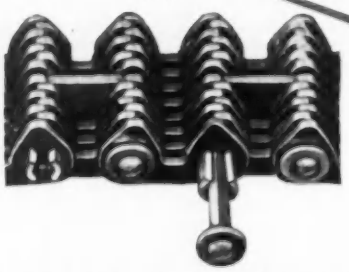
8205 Walck Road, North Tonawanda, New York

HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

Circle 224 on Inquiry Card for more data

why more designs for '60s were proved with LINK-BELT timing chains



Segmental bushings provide automatic joint snugness

Segmental bushings are made with slight bow.

After initial assembly in chain, bushings are straight.

Bow in bushings acts to keep a snug joint on nonload side, maintaining chain pitch automatically.

1st with bushed joint!

Link-Belt held the original patents for the bushed joint which has contributed so much to the quietness, smoothness and long-lasting efficiency of timing chains. This joint may now be duplicated . . . but never surpassed.

Again this year, leading automotive manufacturers have included Link-Belt Timing Chain in their plans for long life, smoother operation and peak timing drive performance.

Link-Belt offers segmental bushings for automatic joint snugness, with no "slap" on the nonload side. Built-in check in joints permits forward articulation for sprocket contact without back-bend.

Let our engineers show you how this space-saving 11/16-in. chain can fit into your plans. Specifications are available in Book 2065. Write for your copy. 15,312

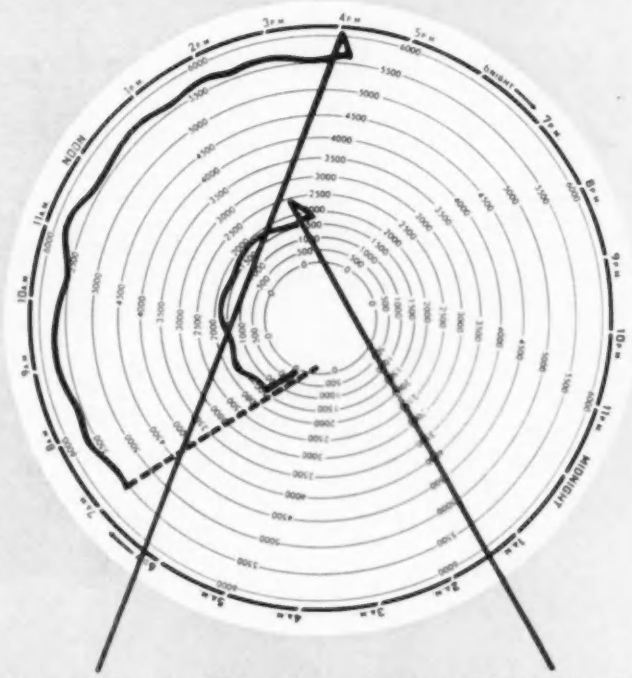
LINK-BELT

TIMING CHAIN AND SPROCKETS

LINK-BELT COMPANY: 220 South Belmont Ave., Indianapolis 6, Ind.

STEAM RECORDERS SHOW

$25,000 a year savings



HOT PHOSPHATING LINE—
5742 lbs. steam per hour

COLD BONDERITE LINE—
1561 lbs. steam per hour

. . . WITH COLD BONDERITE SYSTEM

A manufacturer of household appliances decided to find out for himself! Steam recorders were hooked to two identical 5-stage phosphating lines—one using conventional hot solutions and the other line using the Cold Bonderite System.

Steam consumption on the "hot" line measured 5742 pounds per hour; the Cold Bonderite line used only 1561 pounds per hour. A difference of 4181 pounds, or *72.8%!*

Converted to dollars, the manufacturer estimates that Cold Bonderite, on all his production, will save $25,878 per year.

He is changing his other phosphating lines to the Cold Bonderite System as quickly as he can!

Cold Bonderite Systems operate at temperatures from 40 to 75° below conventional phosphate systems for surface treatment of metals. Coatings are of highest quality. Savings are *automatic.* Balanced formulation permits the use of accelerated solutions, easy to operate and control. You can choose between zinc or iron phosphates. Spray or immersion application to fit your production requirements.

The changeover to a Cold Bonderite System is simple and quick. Act now. You can have it installed and working to save you money by this time next week.

Call in your Parker representative today!

Since 1914— leader in the field

Parker Rust Proof Company

2178 E. MILWAUKEE, DETROIT 11, MICHIGAN

BONDERITE corrosion resistant paint base

BONDERITE and BONDERLUBE aids in cold forming of metals

PARCO COMPOUND rust resistant

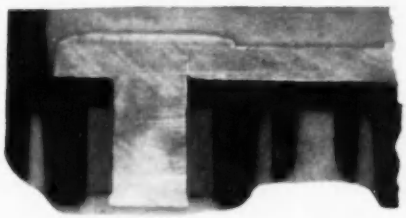
PARCO LUBRITE—wear resistant for friction surfaces

TROPICAL—heavy duty maintenance paints since 1883

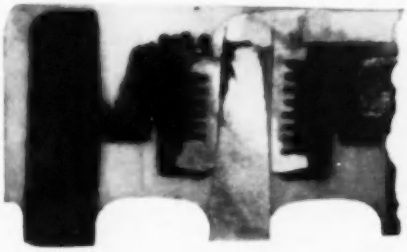
**Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.*

Circle 226 on Inquiry Card for more data

AX	15 28	17 30	20 35	25 42	30 47	35 53	40 60	50 70
D_i	15 .5906	17 .6693	20 .7874	25 .9843	30 1.1811	35 1.3780	40 1.5748	50 1.9685
D_e	28 1.1024	30 1.1811	35 1.3780	42 1.6535	47 1.8504	53 2.0866	60 2.3622	70 2.7559



RUBBER BUSHINGS employed by Globe fit tightly around the post—block passage of acid between post and bushing. Note absence of link corrosion.



LEAD BUSHINGS permit "post acid creep." Photo shows corrosion caused by acid that went once too often to the weld — "concentrated cell" effect at the weld between the post link and the bushing.

from GLOBE'S new research center:

an acid barrier that ends battery-killing link corrosion

Major problem common to 12-volt batteries is premature failure caused by corrosion of the links. Such corrosion occurs when a considerable amount of acid is available on top of the battery. Poor lead burning between the element post, the lead bushing in the battery cover and the link permits acid to creep up along the post — to a point only a fraction of an inch from the exterior of the battery. Result is the so-called "concentration cell" effect and opening of a passageway to the outside of the battery.

Globe's solution — two years ago Globe-Union introduced the one-piece cover construction with rubber bushings. These rubber bushings fit tightly around the post, eliminating the possibility of acid creeping up . . . eliminating the "concentrated cell" effect at the weld between post link and bushing.

Globe research at its best — as it has been for over 30 years! A program of development that benefits both the original equipment manufacturer and the service industry. Write for the complete story.

GLOBE ONE-PIECE COVER is added insurance against leakage to the outside. Partitions are tongue and grooved, epoxy sealed to the case, making one inseparable, leakproof unit.

SPINNING POWER
GLOBE-UNION
SPLIT-SECOND STARTING

GLOBE-UNION INC.

MILWAUKEE 1, WISCONSIN

If it's petroleum-powered there's a ***GLOBE-BUILT BATTERY*** *right from the start!*

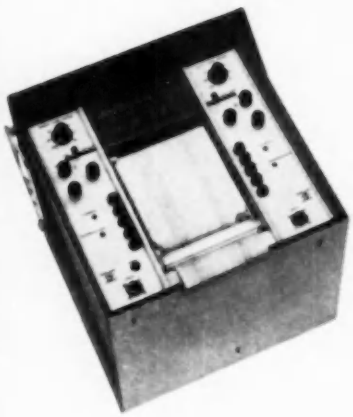
Globe Spinning Power Batteries are now available for fast, low-cost shipment from 15 strategically located plants — 14 (*) now producing dry-charged batteries:

*ATLANTA, GA.; *DALLAS, TEXAS; *EMPORIA, KANSAS; *HOUSTON, TEXAS; *LOUISVILLE, KY.; *MEDFORD, MASS.; *MEMPHIS, TENN.; *MILWAUKEE, WIS.; *PHILADELPHIA, PA.; *REIDSVILLE, NORTH CAROLINA; *SAN JOSE, CALIFORNIA; *HASTINGS-ON-HUDSON, NEW YORK; *LOS ANGELES, CALIFORNIA; OREGON CITY, OREGON; *TAMPA, FLORIDA.

keep an accurate graphic record

OF RESEARCH, DESIGN, TEST DATA

two channels



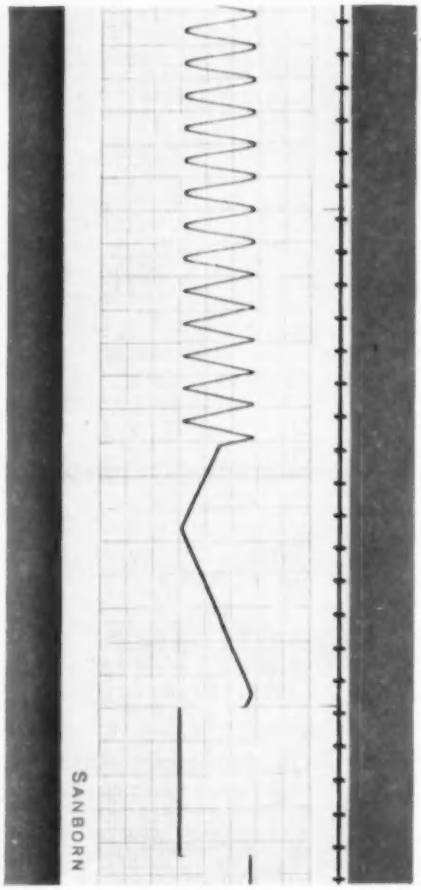
For General Purpose DC Recording — Model 320

For recording *two variables* simultaneously, the Model 320 provides a versatile, transistorized amplifier for each input signal. The rugged 2-channel recorder assembly has heated stylus recording on two *50 mm wide* rectangular coordinate channels, 4 pushbutton chart speeds, and 6 inches of visible chart. The Recorder can be placed vertically, horizontally or at a 20° angle.

MODEL 320 SPECIFICATIONS

Sensitivity: 0.5, 1, 2, 5, 10, 20 mv/mm and v/cm
Frequency Response: 3 db down at 125 cps, 10 mm peak-to-peak
Common Mode Voltage: ±500 volts max.
Common Mode Rejection: 140 db min. DC
Calibration: 10 mv internal ±1%
Output Connectors for each channel accept external monitoring 'scope or meter
Price: $1495

NEW SANBORN PORTABLE DIRECT WRITING RECORDERS FOR IN-PLANT, LABORATORY OR FIELD RECORDING



Two models of this 21 lb. brief case size recorder are available — Model 301 for AC strain gage recording, Model 299 for general purpose DC recording. Both provide immediately visible, inkless traces by heated stylus on 40 division rectangular coordinate charts . . . frequency response to 100 cps . . . 5 and 50 mm/sec chart speeds . . . approx. 4 inches of record visible in top panel window.

single channel

MODEL 301 SPECIFICATIONS

The amplifier section of the Model 301 is an all-transistorized carrier type with phase sensitive demodulator. The power supply and internal oscillator circuits are also transistorized.
Sensitivity: 10 uv rms/div (from transducer)
Attenuator Ratios: 2, 5, 10, 20, 50, 100, 200
Carrier Frequency: 2400 cps internal
Transducer Impedance: 100 ohms min.
Calibration: 40 uv/volt of excitation
Output Connector: for external monitoring 'scope or meter
Price: $750

MODEL 299 SPECIFICATIONS

Combines the dependability of transistors with the high input impedance of vacuum tubes for reliable broad band DC recording.
Sensitivity: 10, 20, 50, 100, 200, 500 mv/div and 1, 2, 5 and 10 v/div
Input Resistance: 5 megohms balanced each side to ground
Common Mode Voltage: ±2.5 volts max. at 10 mv/div sensitivity increasing to ±500 volts max. at other sensitivities
Common Mode Rejection: 50:1 most sensitive range
Calibration: 0.2 volt internal ±1%
Output Connector: for external monitoring 'scope or meter
Price: Model 299 (with zero suppression) $700
Model 299A (without zero suppression) $650

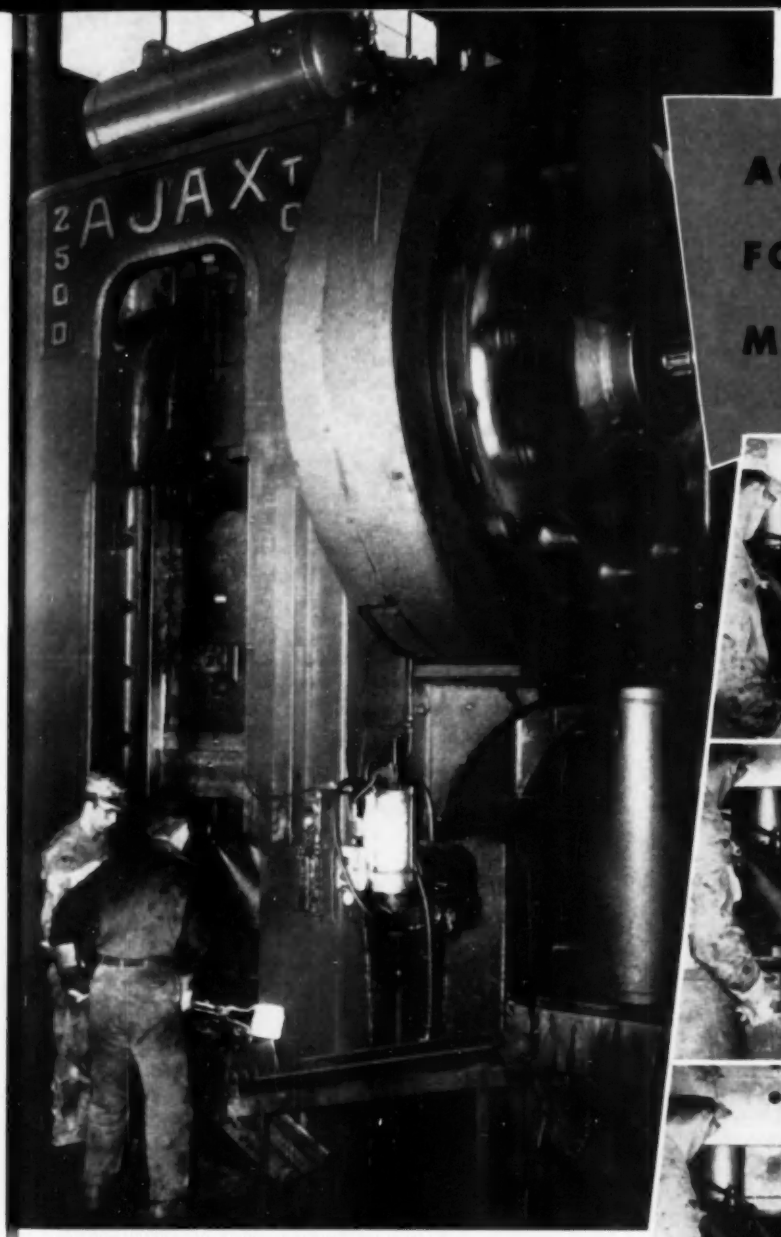
All prices are F. O. B. Waltham, Mass., within continental U. S. A. and are subject to change without notice.

Contact your Sanborn Sales-Engineering representative for complete information, or write the main office in Waltham. Sales-Engineering representatives are located in principal cities throughout the United States, Canada and foreign countries.

SANBORN COMPANY
INDUSTRIAL DIVISION 175 Wyman Street, Waltham 54, Mass.

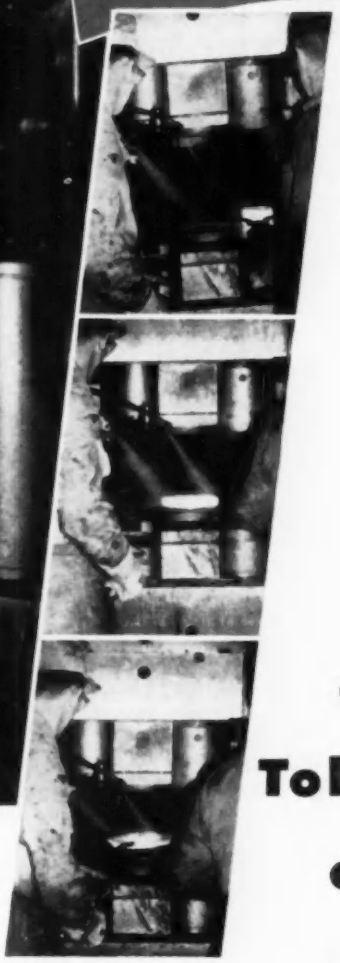
Circle 229 on Inquiry Card for more data

Circle 230 on Inquiry Card for more data



JACKSON DROP FORGE CO., JACKSON, MICHIGAN

ACCURATE PRESS FORGINGS REDUCE MACHINING COSTS



Progressive Multi-stage Forgings as shown above are Forged in one heat with less draft on AJAX Forging Presses. Machining is reduced to a minimum for a saving in both time and material.

Powerful AJAX Presses are fast operating and well-aligned—built with a solid steel frame in sizes 300 ton to 8000 ton capacity.

There is an AJAX Press to fit your particular Forging requirements . . .

Write for Bulletin 75C

Forged to Close Tolerances on AJAX Forging Presses

AJAX METAL WORKING MACHINES

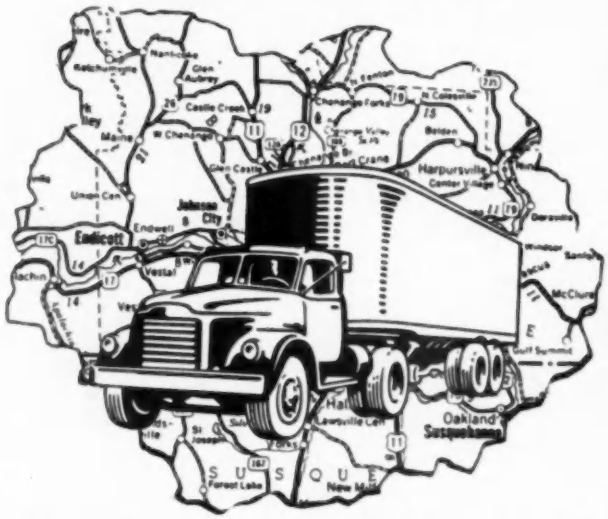
FORGING PRESSES — FORGING MACHINES — FORGING ROLLS — AJAX-HOGUE WIRE DRAWERS

THE AJAX MANUFACTURING COMPANY . . . . . CLEVELAND 17, OHIO

CHICAGO OFFICE: 110 S. DEARBORN ST., CHICAGO 3, ILLINOIS

W. P. WOOLDRIDGE CO. • BURLINGAME, CAL. • LOS ANGELES 22, CAL.

Do the auxiliary fuel tanks on your trucks meet every safety requirement?



WHEN YOU SPECIFY **SNYDER** TANKS YOU'RE ABSOLUTELY SURE THEY DO BECAUSE ONLY **SNYDER** . . .

● PICKLES ALL STEEL to remove mill scale abrasives. And Snyder vacuums and magnetically cleans each tank to ensure safe, dirt-free operation.

● FOG SPRAYS EACH TANK'S INTERIOR to prevent rust.

● FLANGES ALL TANK HEADS to give extra insurance against rupture from impact. Ribbed bottoms and bossed heads strengthen and stiffen all flat bottom tanks to better withstand road shock.

● MACHINES TOP OF FILLER NECK to guarantee positive gasket seating of cap eliminating fill cap leakage. Ball check vent in top of tank provides full ventage.

● SUBMERGES EVERY TANK IN WATER and pressurizes with air to test for and correct leaks. After this test, every tank is visually inspected before shipment.

● MAINTAINS COMPLETE TANK RESEARCH AND TEST FACILITIES. Snyder, pioneer in safety tank design, continues to lead the field with tanks custom engineered and designed to meet the most rigid standards, provide economical efficient fuel supply, and incorporate *all* safety features.

● AVAILABLE IN STEEL OR ALUMINUM No matter what make and model truck you want to fit, no matter what style and capacity tank you desire, Snyder's trained sales engineers and Engineering Department are available to assist you. And each Snyder Tank is designed, built and tested to the highest quality standard in the industry. You can rely on them.

For safety, satisfaction and service, be sure to:
ALWAYS SPECIFY SNYDER

Snyder Tank
CORPORATION
P. O. BOX 14, BUFFALO 5, N. Y.

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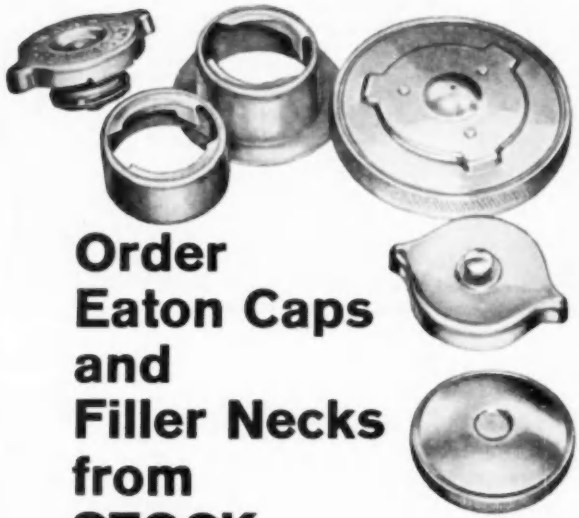

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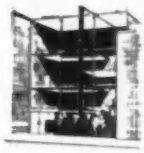
A CHILTON  PUBLICATION

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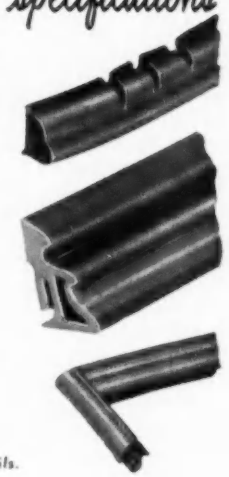

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By C. J. Kelly
ASSISTANT EDITOR

Carbide Application 1

The proper application and use for a specific job is the key to long life and high production when using cemented carbides. Technical data paper number 60-1WN describes the various components of each grade and indicates the proper use of each grade. *Wesson Co.*

Gauging Shortcuts 2

New approaches to gauging techniques are described in a four page booklet. Illustrated are methods of shortcutting many normally tedious production and inspection operations. Some of the areas covered are: hole location; hole spacing; measurement of dovetails; inspection for concentricity and other applications. *Precision Grinding, Inc.*

Management Strategy 3

A new manufacturing system, in comparison to conventional methods, is described in a 16 page bulletin that shows, in pictures, how a workpiece was processed from print to finished machined part in eight working days. *Kearney and Trecker Corp.*

Filter Catalog 4

Consisting of 180 pages, a new catalog thoroughly covers oil, fuel and air filters and cartridges for all domestic and imported passenger cars, trucks, buses and agricultural, industrial and marine engine applications. *Walker Mfg. Co.*

Slide Calculators 5

Two newly designed slide calculators are offered to personnel that are involved in the various metalworking industries. This three piece set includes a Carb-A-Guide card and a brown plastic shirt holder. Some of the technical data that is available with these calculator cards includes: Hardness data; speed conversion; milling feed rates; horsepower and just about everything required for a specific machining operation. *Adams Carbide Corp.*

Rotary Solenoids 6

An engineering data sheet completely describes the technical details of a new 112 in. lb deg rotary solenoid. Charts and graphs are included along with design and specification data. *Pascol Div., Illinois Tool Works.*

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Small Engines 7

An illustrated brochure covers a complete line of air-cooled, 2-cycle engines, designed for various applications on saws, pumps, generators, powered equipment and many other uses. Specifications, design data and technical informatian is included in this booklet. *West Bend Aluminum Co.*

New Porous Metal 8

A two page technical bulletin discusses a new type of porous metal made by wire winding techniques. It covers both filtration and non-filtration applications of this metal. Typical applications and outstanding features of this new development are also covered in the publication. *Bendix Filter Div., Bendix Aviation Corp.*

Tracing Templates 9

Full-size tracing templates are contained in a new 16 page folder that was devised to aid the design engineer to trace the exact mounting style, bore, and stroke he wishes to use. A chart lists the maximum recommended strokes for various mountings. *Control Equipment Line.*

Silicone Materials 10

This recently published 12 page engineering guide explains how various physical forms of silicones contributed to reliability, miniaturization, modularization and environmental protection; increase serviceability over wide extremes of temperature; and aid value engineering.

Well illustrated, this new "materials handbook" contains engineering data and processing information on silicones, and details the important electrical and mechanical properties of the silicones most useful in electronics. *The Dow Corning Corp.*

Friction Materials 11

Practical pointers on inspection, maintenance, material selection and installation are included in an eight page booklet that has been designed to improve efficiency on construction and industrial equipment that requires friction materials. Also included is data on three different types of these materials that are required for heavy-duty brakes and clutches. *World Bestos.*

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Industrial Engines 12

Eight pages cover a line of power plants that have been designed for various industrial applications. Cut-away views, charts line drawings give a complete picture of this line. *Allis-Chalmers Mfg. Co.*

Power Units 13

Numerous illustrations and specifications cover a line of power units that have been developed for various material handling equipment. A chart shows the technical specifications of these plants. *The Ready-Power Co.*

Fluid Drives 14

Technical data and illustrations assist in describing a complete line of fluid drive mechanisms that are covered in a 20 page bulletin. It gives the principles of operation and shows typical applications. Cut-away illustrations and dimensional drawings are also included. *American Radiator and Standard Sanitary Corp.*

How to Use "Teflon" 15

An eight page illustrated pamphlet tells how to use Teflon in sheets, rods, tubes, tape and other standard shapes. This pamphlet covers inspection, fabrication and recommended applications. *Cadillac Plastic and Chemical Co.*

Finishing Data 16

A new data sheet covers abrasive finishing methods and materials for copper plate. Types of finishes discussed include color, high color, satin and butler. *The Lea Mfg. Co.*

Exhaust Purifiers 17

Exhaust problems are discussed in a four page booklet that illustrates a line of purifiers that have been designed for oxidizing carbon monoxide fumes. Recommended applications for these units are on fork trucks, stationary engines, power sweepers, and various other uses. *Oxy-Catalyst, Inc.*

Weld Instructions 18

A pocket size booklet describes the operation and use of the carbon arc welding process. Many applications are illustrated in this manual. *Aircair Co.*

Drafting Tables 19

Many illustrations and a cutaway view, plus a chart of specifications give a clear picture of a line of drafting tables known as the Desk-O-Matic. *Mayline Co.*

Strain Measurement 20

A four page product data sheet discusses a method of checking strain measurement in areas that are difficult to obtain precision data. Covered are crevices, fillets, corners, keyways, gear teeth and numerous other applications. Line drawings, graphs and tables add supporting information. *Baldwin-Lima-Hamilton Corp., Electronic and Instrumentation Div.*

New Lubricant 21

Four pages cover the applications of a new type of lubricant. It was designed for lubricating such areas as conveyor components and chains that are exposed. *The Whittmore Mfg. Co.*

Storage Equipment 22

Phosphatized steel storage equipment is discussed in a well illustrated bulletin that covers the specifications of the design and construction details. *Penco, Div. Allen Wood Steel Co.*

Construction Data 23

A four section, 37 page booklet deals with properties of materials, power components, motive units and machinery employed in the design or fabrication of machinery for the construction industry. This booklet is entitled "Nickel Alloy Steels and Other Nickel Alloys in Engineering Construction Machinery." *The International Nickel Co.*

Epoxies 24

Epoxies in the foundry are covered in an eight page brochure. Ten applications are outlined showing savings, advantages and the operation in general. *Furane Plastics Inc.*

Milling Equipment 25

Three sizes of portable milling units are discussed in a six page brochure. Covered are design features, specifications, accessories and sample application possibilities. *The Dunmore Co.*

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Ultrasonic Cleaning 26

A well illustrated brochure contains a brief synopsis of the growth of ultrasonics and this firm. It covers the fields that this type of cleaning may be employed in and shows applications, advantages and capabilities of the process. Charts and graphs give recommended combinations and specifications of the line. Also in chart style is various engineering data. *Branson Ultrasonic Corp.*

Gear Shaving 27

Prepared especially for gear designers, engineers and production supervisors, a new comprehensive, profusely illustrated manual covers important gear shaving and production information. Graphs and line drawings are included to show the information as clear as possible. *National Broach and Machine Co.*

Gearing System 28

A descriptive pamphlet introduces a new gearing system that is designed to operate through a ratio range of 3-to-1 to 400-to-1. This well illustrated booklet shows the system's relation to other types of face-gearing as well as design details and manufacturing processes. *Spiroid Div., Illinois Tool Works.*

Power Steering 29

Component selection tables, performance curves, and typical examples for determining the proper size steering components to meet various turning speeds and steered axle requirements are discussed in a 17 page brochure. Charts, graphs, illustrations and line drawings are included to complete the information. *Vickers Inc.*

"Better Welds" Guide 30

Eighty pages, in vest pocket form, are devoted to better welds. It contains information on five essentials for proper welding procedures, examples of good and bad welds, welding positions and materials, safety, electrode cost data, electrode selection factors and numerous other categories. *Hobart Brothers Co.*

Aluminum Brochure 31

A twelve page booklet reviews the full range of shapes, sizes, and alloys available in primary aluminum pig, ingot, and billet and in wrought aluminum mill products. Complete metallurgical tables and helpful design information make the brochure a significant reference for designers, engineers, purchasing agents, production men, and metallurgists. *Harvey Aluminum.*

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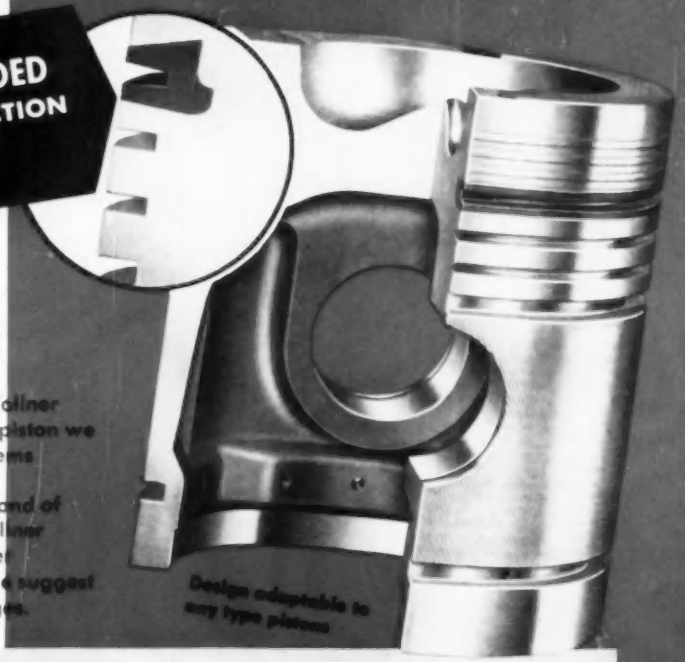
#1 Piston choice of Diesel Engine Builders KEEPS ENGINES POWERFUL LONGER–AT LOWER COST

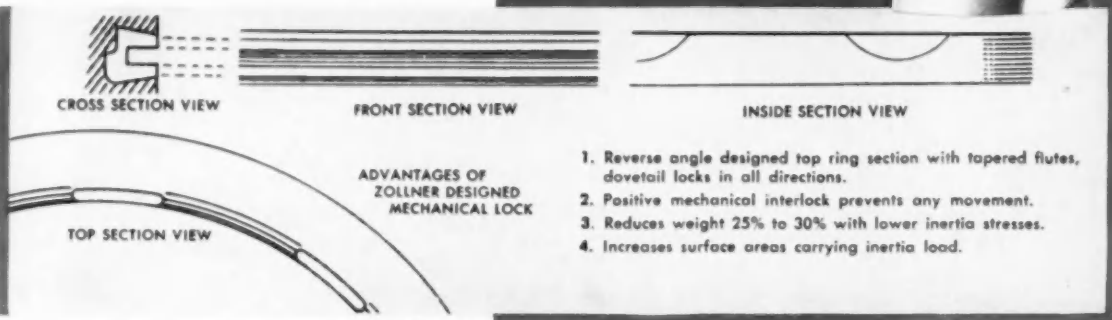
BOND LOC

Exclusively **DOUBLE BONDED**
"Ni-Resist" IRON TOP RING SECTION
METALLURGICALLY A1-Fin Process
MECHANICALLY Zollner Lock



Stops Ring Groove Wear

Everywhere, engine builders and transport operators enthuse over the performance of Zollner Bond-O-Loc Pistons — "The greatest mileage piston we have ever used. Top ring groove wear problems are eliminated by the 'Ni-Resist' Iron section **permanently** incorporated with the double bond of both A1-Fin metallurgic **and the exclusive** Zollner mechanical lock." For longer piston life, better performance and lower maintenance cost, we suggest your immediate test of Bond-O-Loc advantages.



1. Reverse angle designed top ring section with tapered flutes, dovetail locks in all directions.
2. Positive mechanical interlock prevents any movement.
3. Reduces weight 25% to 30% with lower inertia stresses.
4. Increases surface areas carrying inertia load.

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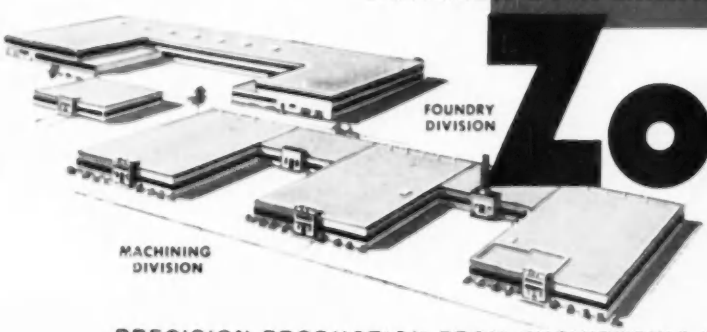

ZOLLNER
HEAVY DUTY PISTONS

PRECISION PRODUCTION FROM ENGINEERING TO FOUNDRY TO FINISHED PISTONS

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Remember when

HIS NINTH INNING SINGLE GAVE DETROIT THE WORLD SERIES

Three games to two in the 1935 World Series. One out and a man on in the last of the ninth with the score tied at Navin Field. Goose Goslin singles and the runner scores. The Tigers beat the Cubs and are World's Champions for the first time.

What gives pros that dependability that comes out in the clutch and from day to day? It's the old copy book virtues: constant practice, singleness of purpose and fighting till the last man is out.

The same qualities make the pro in business. When it comes to bearings, no one has had more experience than the craftsmen and scientists of the Timken Company. All their time is devoted to improving just one kind of bearing—the tapered roller bearing. Their single purpose is to pack more and more capacity and performance into a bearing that costs less. To that end, they built the most modern bearing plant in the world. And the all-out effort continues—with results that you can measure in the dollars and cents you save in warranty and assembly costs.

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If you're accustomed to dealing with pros who know their field better than anyone, make sure your bearings are stamped with the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Cable: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steel, Removable Rock Bits.

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